Download Workshop Material

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Advanced Enterprise Architecture Modeling Support through Metamodeling Platforms

Dr. Dominik Bork, University of Vienna

dominik.bork@univie.ac.at

@BorkDominik

University of Pretoria, Pretoria, September 25th 2018

Outline

- Welcome & Introduction
- Metamodeling with ADOxx
- Enterprise Architecture Management
- ArchiMate 3.0.1 and TOGAF
- EAM Case Study
- Discussion & Evaluation

WELCOME & INTRODUCTION

Who we are

- Dr. Dominik Bork
  Post-doctoral Researcher
  University of Vienna, RG Knowledge Engineering
  dominik.bork@univie.ac.at

Project Team:

- University of Vienna
  - Prof. Dr. Dimitris Karagiannis
  - Dr. Dominik Bork
  - Elena-Teodora Miron, MSc
  - Anna Sumereder, BA
- University of Pretoria
  - Prof. Dr. Alta van der Merwe
  - Prof. Dr. Aurona Gerber
  - Dr. Sunet Eybers
  - Dr. Phil van Deventer

The Research Project

- Austria - South Africa Scientific & Technological Cooperation Program
- Goal:
  - Extend the reach of ArchiMate for EA management
  - Involve experts and practitioners of EAM for requirements engineering and evaluation of the modelling tool
  - Develop an open modeling tool for advanced EAM
  - Knowledge transfer through workshops, papers, and tutorials
  - Provide teaching and training material
- Austrian project lead:
  - University of Vienna, Prof. Dr. Dimitris Karagiannis
- South Africa project lead:
  - University of Pretoria, Porf. Dr. Alta van der Merwe
- Duration: Jan. 2017 – Dec. 2018

University of Vienna

- Was founded by Duke Rudolph IV in 1365. It is the oldest University in the German-speaking cultural area and one of the largest in Central Europe.

University of Vienna: Some Data

Graduates
in the academic year 2016/17

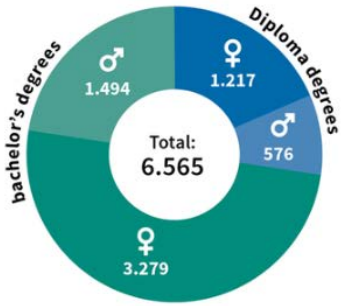
9.473

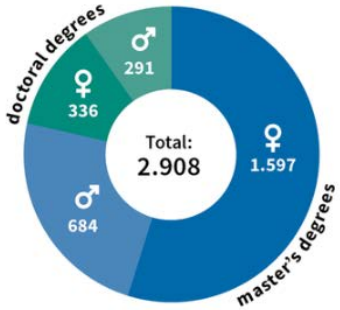
Researchers
some on a part-time basis, as of 31. Dec. 2017

6.695

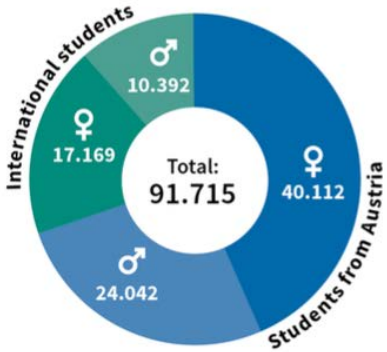
Degree programmes
winter semester 2017/18

178

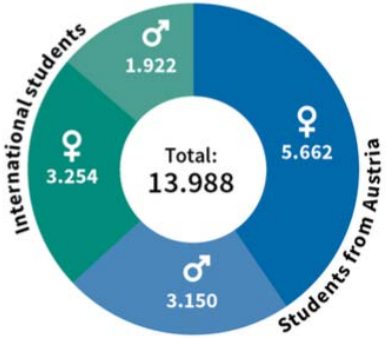




Students
winter semester 2017/18

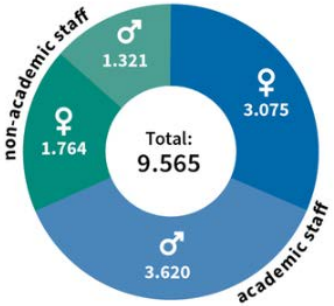


New entrants
winter semester 2017/18



University-wide agreements with other Universities
as of 31. Dec. 2017

Employees
as of 31. Dec. 2017



Adjusted headcount; without persons on leave; persons with more than one employment counted once.

University revenues
1 Jan. to 31 Dec. 2017

Global budget	€ 456 Mio.
Tuition fees	€ 14 Mio.
Other revenues	€ 104 Mio.
Total	**€ 574 Mio.**

Degrees awarded first degrees
2016/17

Degrees awarded further degrees
2016/17

Who are you?

- Would you be willing to
  - briefly introduce yourself, and
  - state, what you expect from this workshop?
  - What is your relation to EAM and ArchiMate?

Open Models Laboratory (OMiLAB)

Lead

- OMiLAB Non-Profit Organization, Berlin

Open Models Laboratories

- OMiLAB Austria – University of Vienna
- OMiLAB Korea - Chonbuk National University

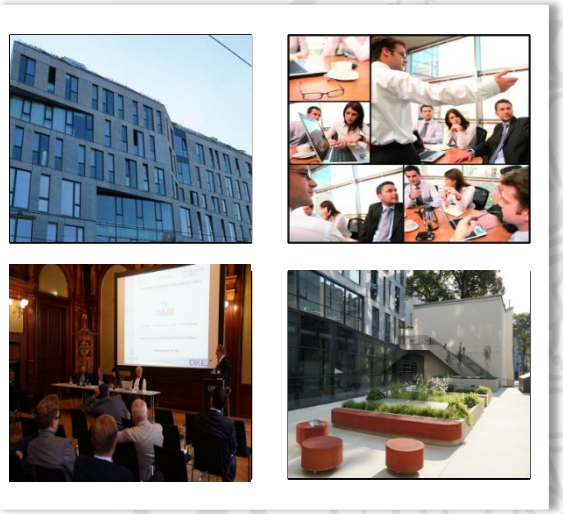
Associated Partners

- University Babes-Bolyai Cluj, Romania
- FHNW, Switzerland

Members

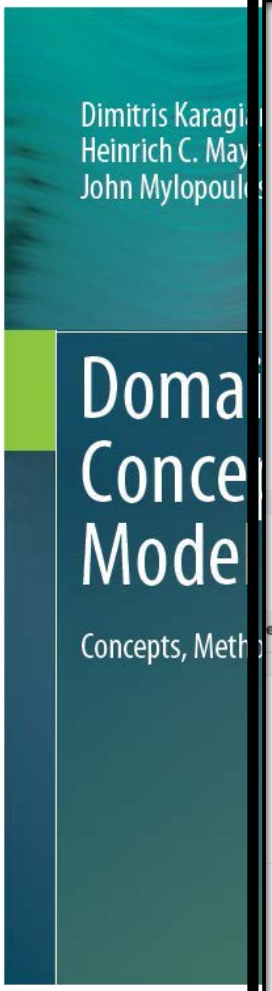
- More than 40 universities
- From 4 continents

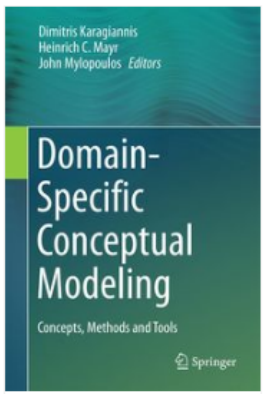
Summer School Students



OMiLAB
www.omilab.org

OMLAB COMMUNITY RESULTS: PUBLICATION(S)





BOOK

Domain-Specific Conceptual Modeling - 2016

Concepts, Methods and Tools

Editors: Dimitris Karagiannis • Heinrich C. Mayr • John Mylopoulos

This book draws new attention to domain-specific conceptual modeling by presenting the work of thought leaders who have designed and deployed specific modeling methods. It provides hands-on guidance on how to build models in a

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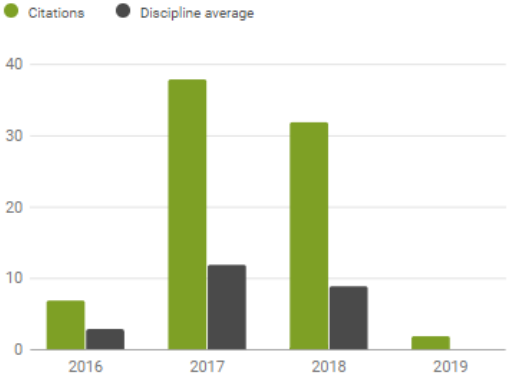
Chapter 11 Multi-perspective Enterprise Modeling—Conceptual Foundation and Implementation with ADOxx	788 Downloads
Chapter 18 Business Process Flexibility and Decision-Aware Modeling—The Knowledge Work Designer	785 Downloads

Citations vs. discipline average



domain-specific
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OMLAB COMMUNITY RESULTS: NEMO 2014 - 2019

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2014	2015	2016	2017	2018	2019

6th Edition in the NEMO Summer School Series

NEXT GENERATION ENTERPRISE MODELLING IN THE DIGITAL Transformation AGE

July 15th - July 26th, 2019 - University of Vienna, Austria

http://nemo.omilab.org/

CALL FOR PARTICIPATION

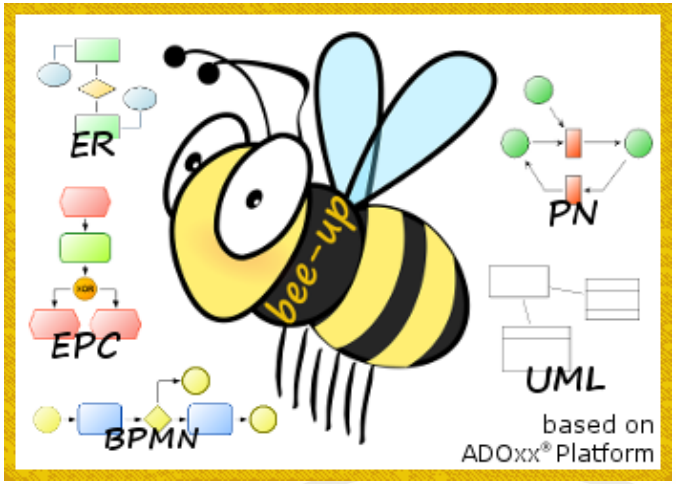
Participating Institutions and Organizers:

OMiLAB IN EDUCATION: For Lecturing

BEE-UP

A collection of "classical" modelling languages employed in different domains, e.g. software and systems modelling, business process modelling, and data modelling.

The tool aims to be support university teachers in basic conceptual modelling courses. It currently supports the following modelling languages:



Business Process Model and Notation 2.0 (BPMN)

Event-driven Process Chains (EPC)

Entity-Relationship (ER)

Unified Modeling Language 2.0 (UML)

Petri-Nets (PN)

OMiLAB in Education: A collection of modeling tools which have been developed in university courses and/or tools that have been specifically developed for teaching purposes.

*www.omilab.org/**bee-up***

OMLAB ENVIRONMENT

Technological Environment consists of

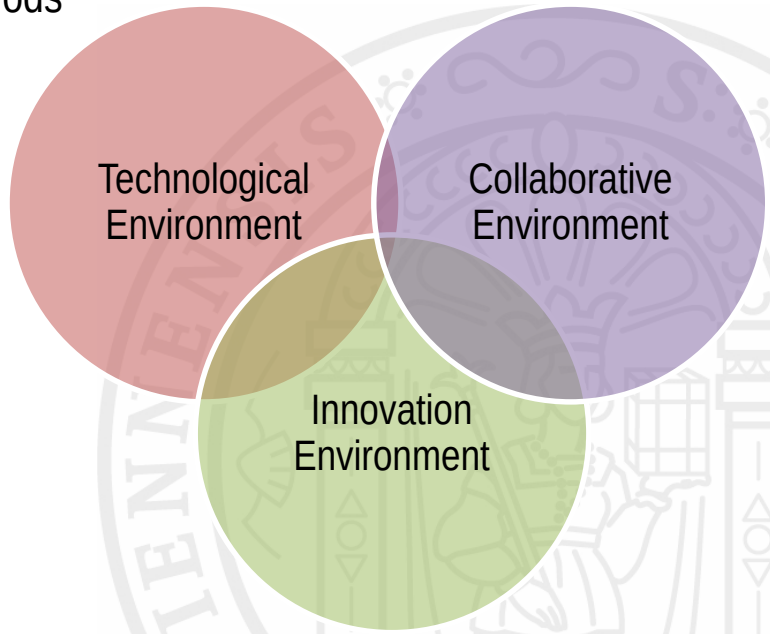
- Core (Open Use): ADOxx on OMiLAB, ConceptBase
- Packaging and professional deployment capabilities
- Add-Ons (Open Source): implemented community tools such as Model Annotator, GraphRep Generator, Model Publisher, Method Publisher, OM-Repository, Meta-Model Browser, MLEA – Modelling Language Engineering Assistant

Innovation Environment provides

- Methodological guidance in the design of modelling methods
- Best practices and tools to foster efficiency
- World-wide network of modelling enthusiast and experts

Collaborative Environment provides

- Web-platform (virtual and physical accessibility)
- Community events like **conferences**, workshops, **summer schools**
- **Publications** like books, conference and journal papers
- Networking activities, newsletters, media and OM-TV



METAMODELING WITH ADOxx

Metamodeling Foundations

Metamodels …

- .. provide the means for the creation of graphical models in that they are models “of a modelling language” [Favre 2005].
- .. define the available modeling constructs, their structure, and allowed combinations.
- .. can be arranged in layered metamodeling hierarchies

Metamodeling Foundations

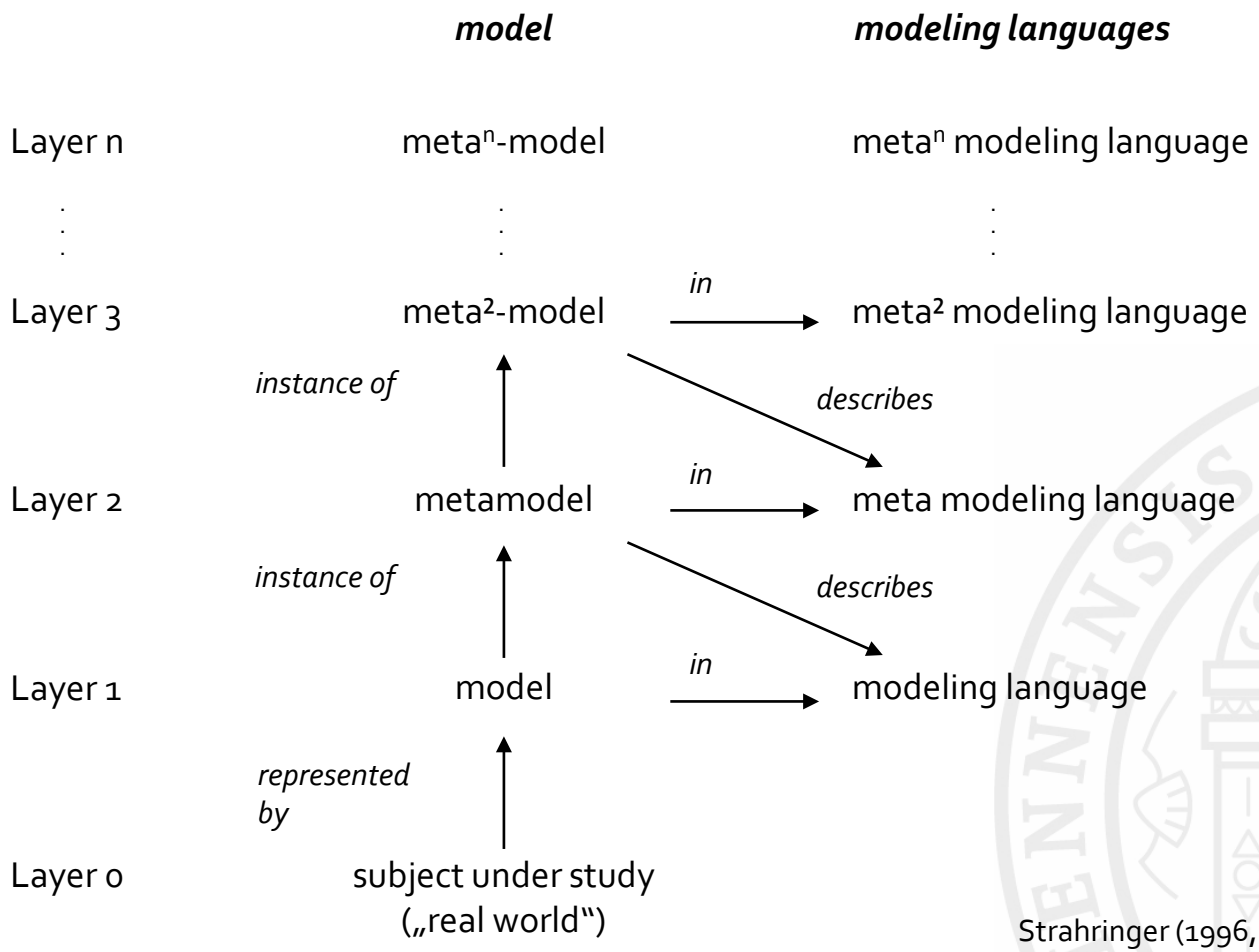
Why we build metamodels

- A metamodel allows explicit definition of the concepts constituting a modeling language
- Explicit metamodels leverage language extensibility
- Enable validation of models
- Management of models within repositories
- Provision of an exchange format (e.g., mapping from the meta-constructs to XML)
- Utilization of model processing functionality (developed on metamodel level, executed on model level)

➢ Enable tool development (metamodeling platforms)

Metamodeling Foundations

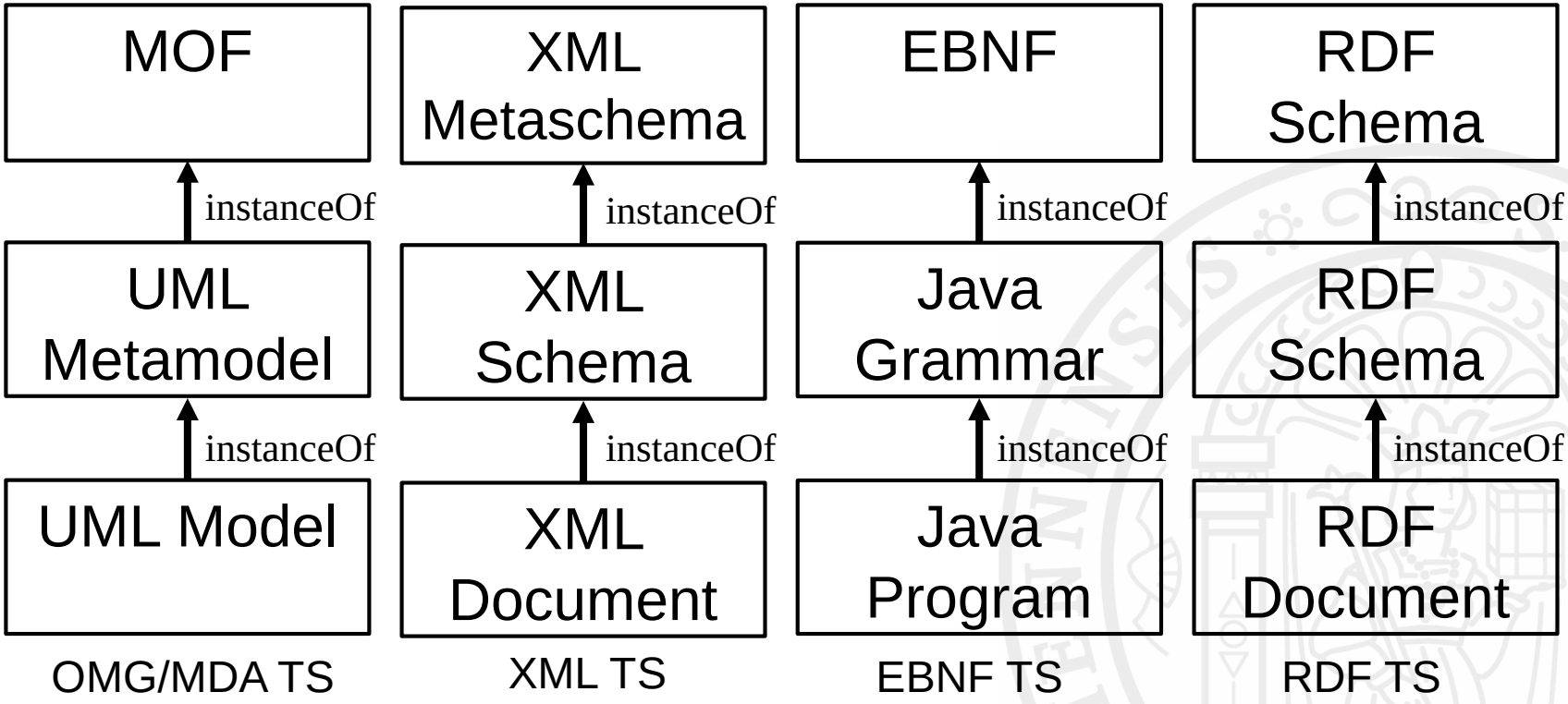
- Metamodeling Stack



Strahringer (1996, adapted)

Metamodeling Stack Examples

- Metamodeling is a generic concept not limited to conceptual modeling:

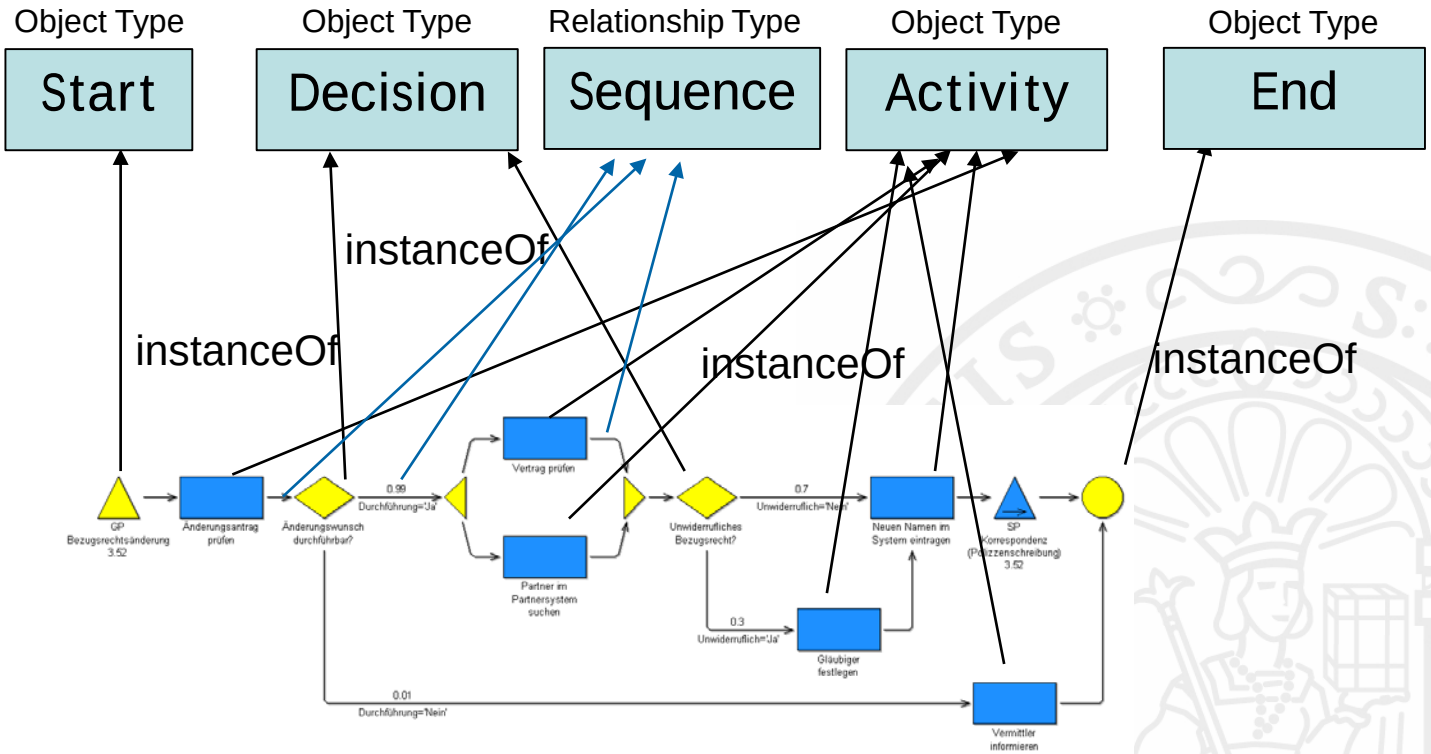


Metamodeling Example: Process Modeling Language

- What concepts are in a corresponding metamodel?

Layer 2 – Metamodel

Layer 1 - Model

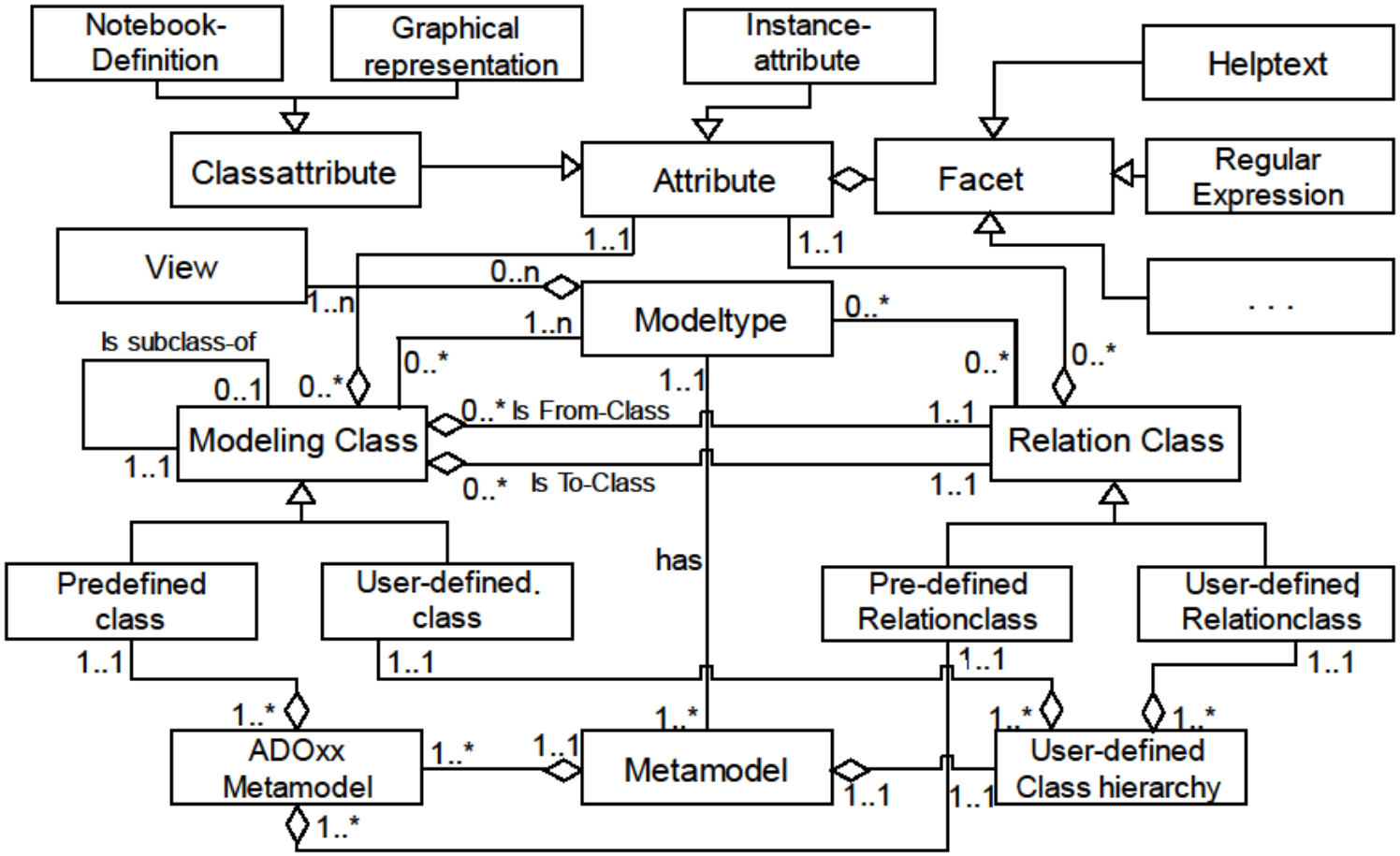


Metamodeling Platforms

Metamodeling Platforms

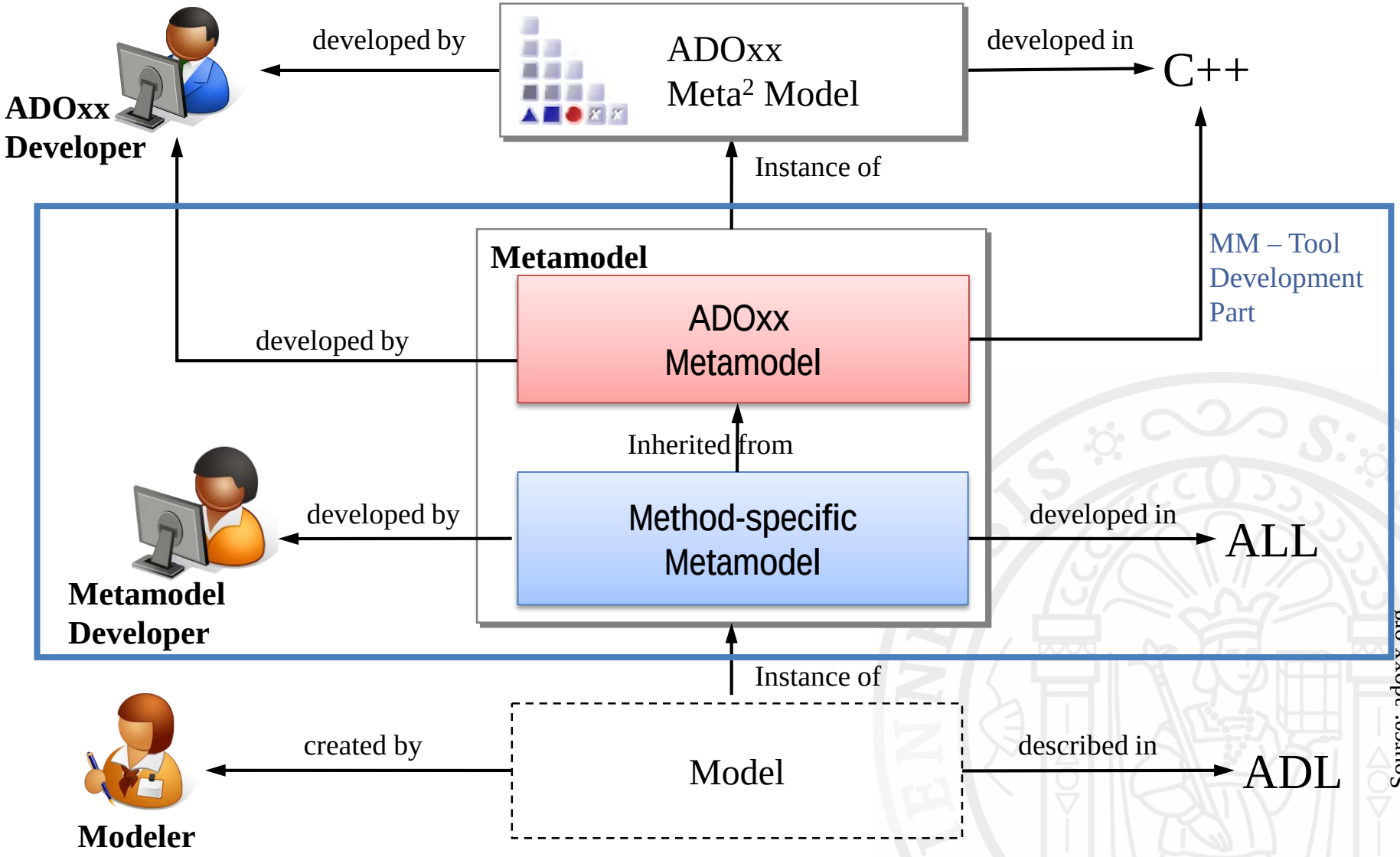
- Provide a meta-metamodel with a rich set of pre-defined concepts and functionality attached to these concepts
  - Functionality can be easily and efficiently inherited
- Raise the abstraction level of modeling language development
- Enable efficient realization of (domain-specific) modeling languages
- Take care of method-independent requirements like user, model, access, data management, as well as the visualization of the models and the user interactions.
- ADOxx, Eclipse Modeling Framework, MetaEdit+, …

ADOxx Meta-Metamodel [Excerpt]



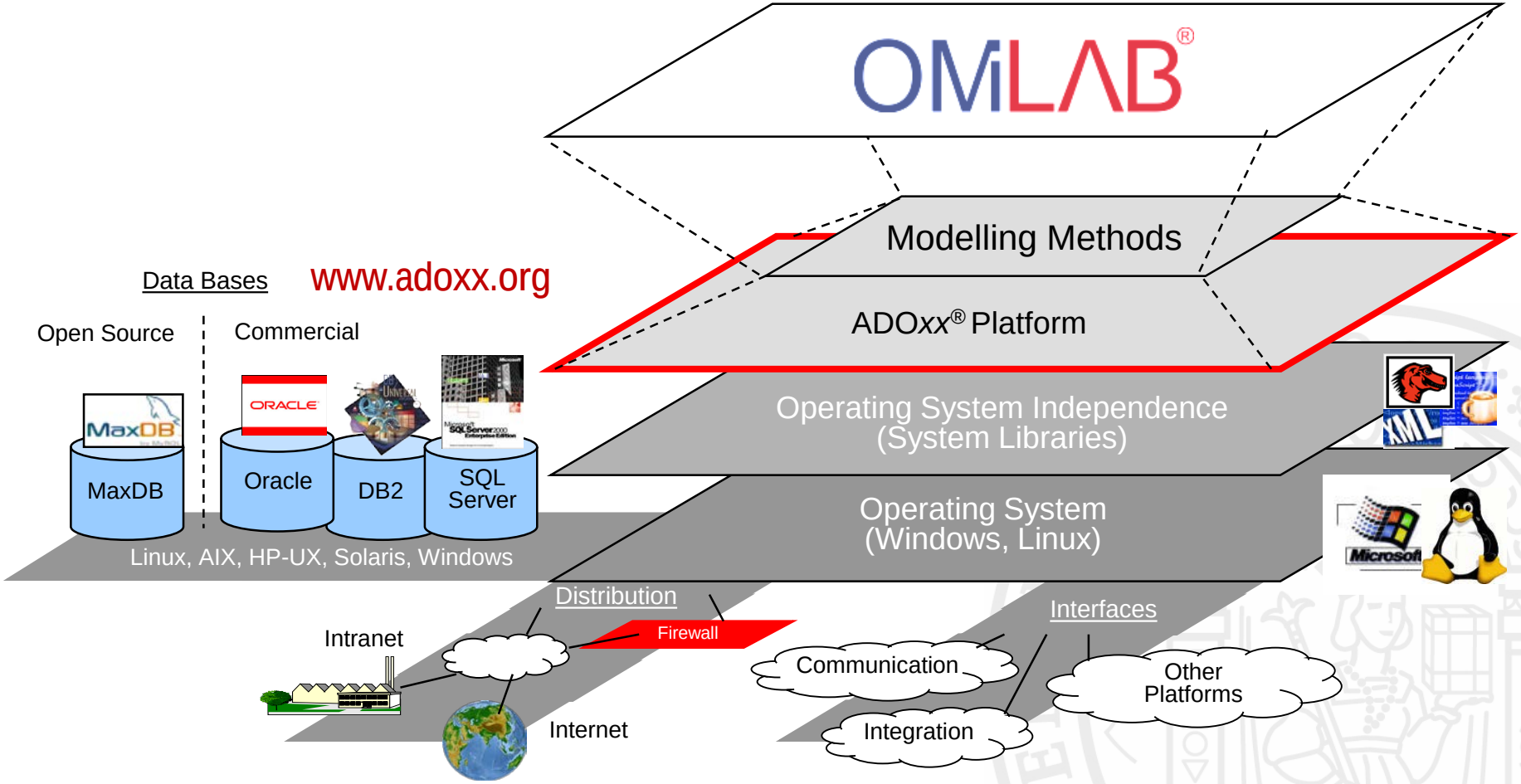
Adapted from Fill, H.G., Karagiannis, D.: On the conceptualisation of modelling methods using the ADOxx meta modelling platform. Enterprise Modelling and Information Systems Architectures 8(1) (2013) 4-25

Metamodeling Platforms: ADOxx Concept

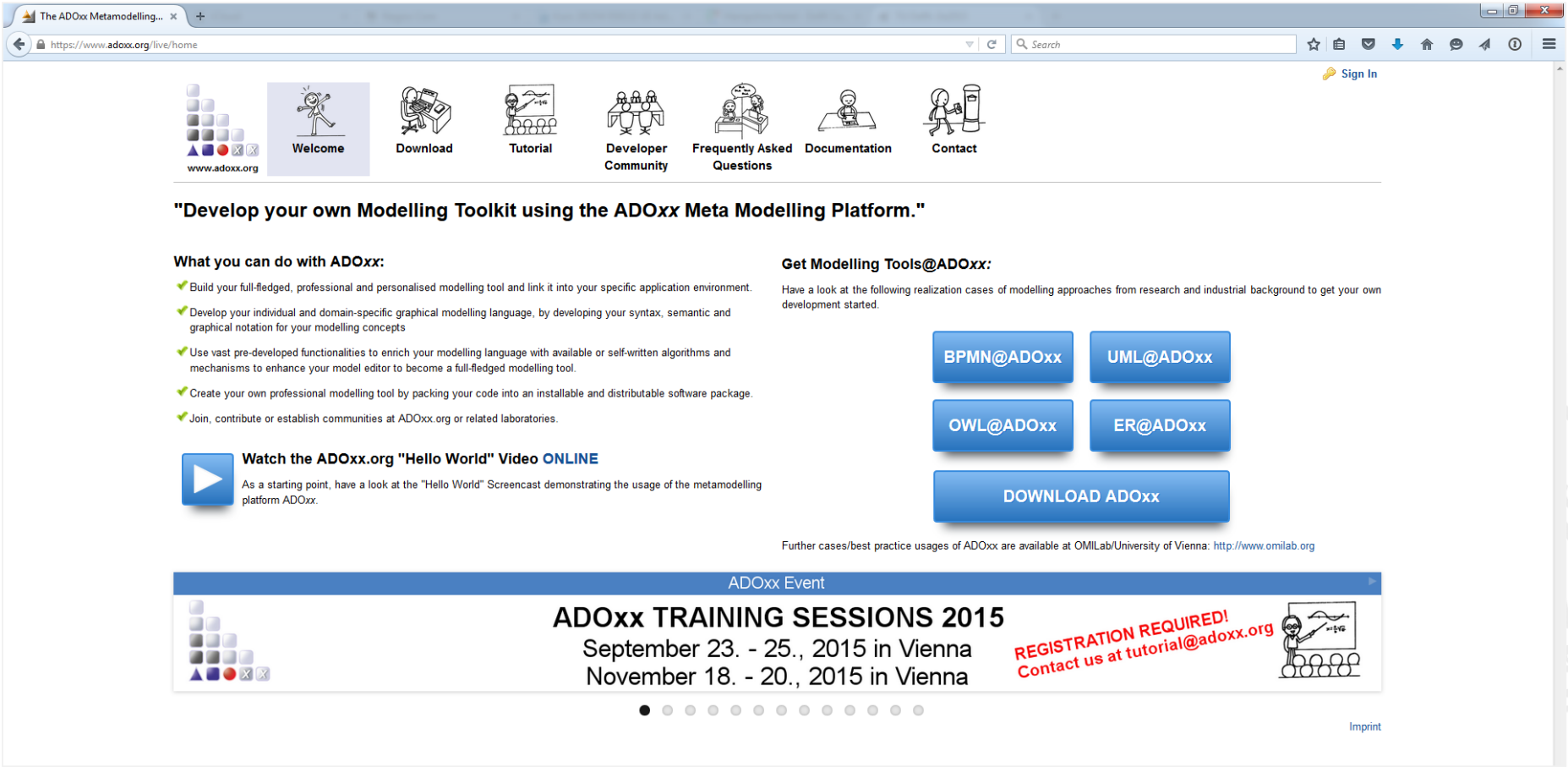


Source: adoxx.org

OMILAB: CORE DEVELOPMENT ENVIRONMENT

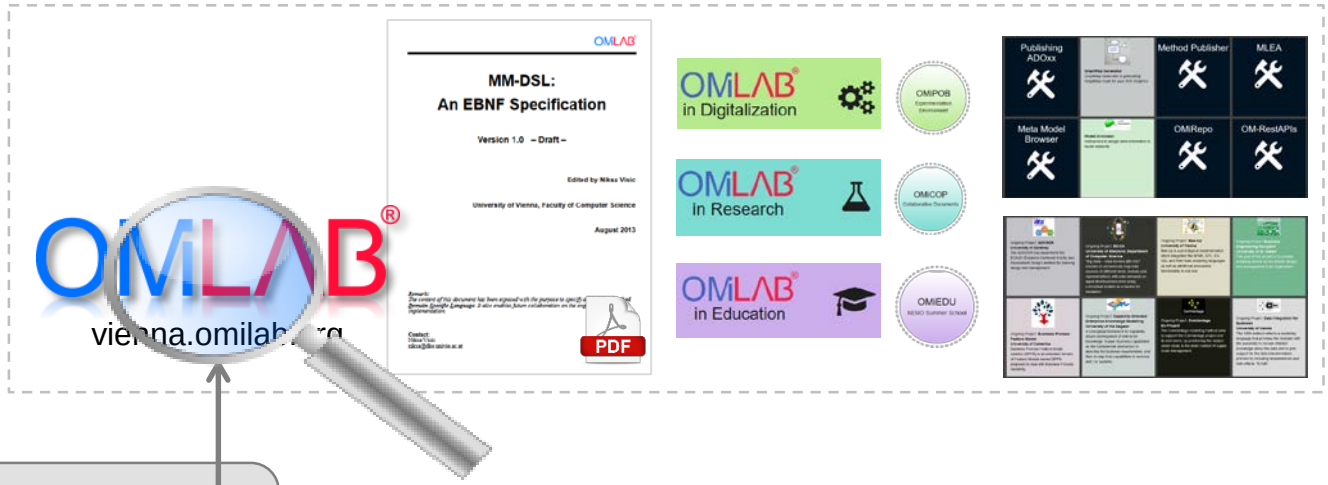


ADOXX.ORG: METAMODELING PLATFORM & DEVELOPER COMMUNITY



www.adoxx.org

ADOxx USAGE PATHS



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Proof of Concept
Modelling Tool Conceptualization

DSM
Domain-Specific Modelling

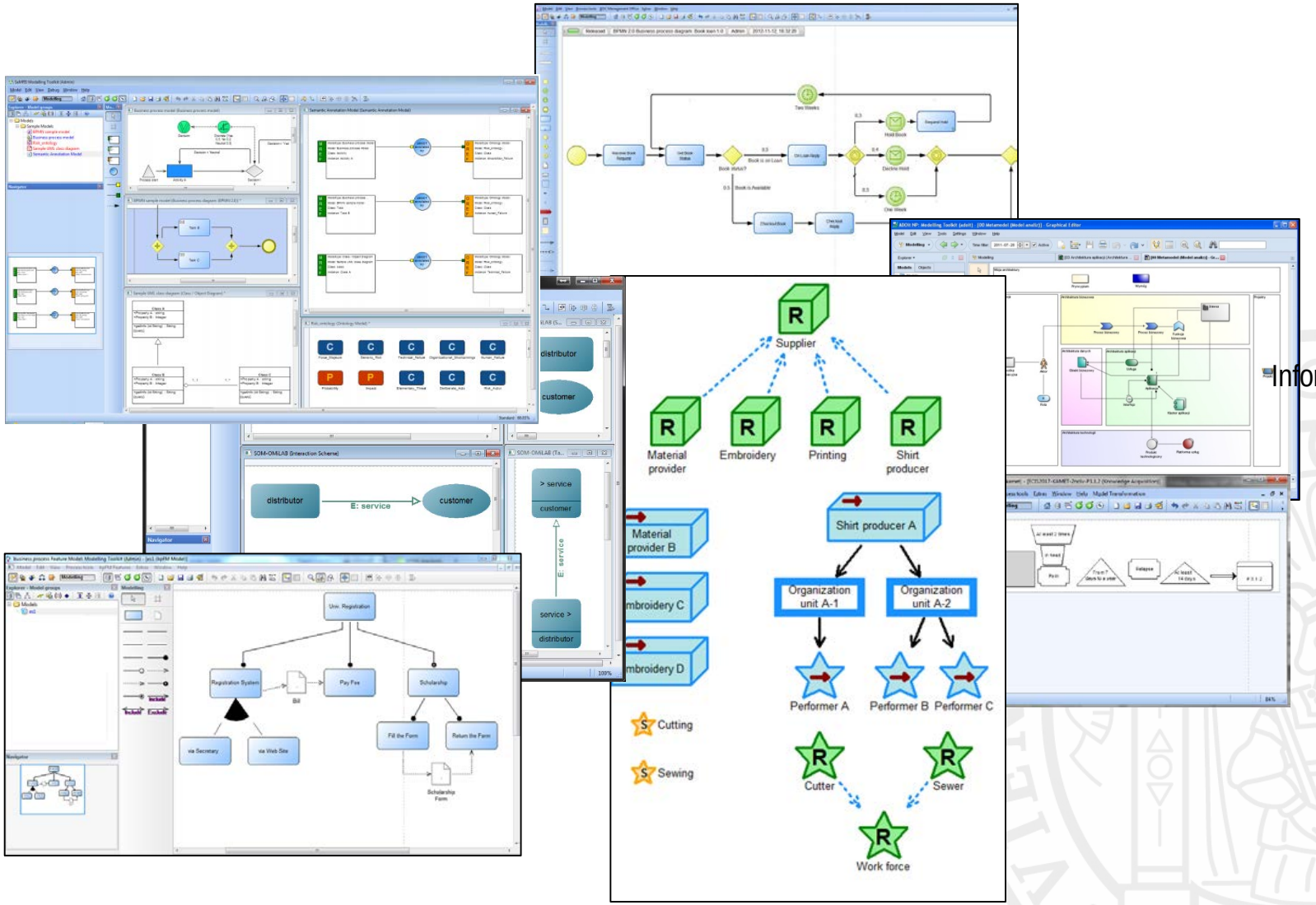
Open-Use
Development Environment

ADOxx
Meta Modelling Platform

ADOxx.org

ADOxx Community Edition

SUCCESSFUL MODELING TOOL IMPLEMENTATIONS



ADOxx Horus Method
BEE-UP
BEN
BIM
BWW
CIDOC
ComVantage
COPROM
DIBA
EC
eduWeaver
eGPM
EKD
IMP2.0
Information Security
iStar
iStarSuperSet
JCS
MeLCa
MoLAP
MoSeS4eGov
OKM
OMiStarT
PetriNets
pmSOA
PROMOTE
SDbD
Secure Tropos
SemFIS
SOM
VLML

http://www.omilab.org/psm/content/ep/globalnetworkservice?view=tilestools

OMiLAB DOMAINS

Created with Wordle, http://www.wordle.net

THE START-UP WITHIN OMLAB®:
A *Free Contribution*
for the Community

START-UP PACKAGE:
Training, Content and FAQ

Modelling Method

Implementation based on ADOxx.org

Proof of Concept

Information Channels

Free Training

Presence Trainings, Webinars

Free Implementation

Implementation Examples, Cases

Free Specification and Approach

AMME, MM-DSL, FDMM, …

ENTERPRISE ARCHITECTURE MANAGEMENT

Motivation

Enterprise Architecture is not about building models.
It is about solving enterprise problems while iteratively building models

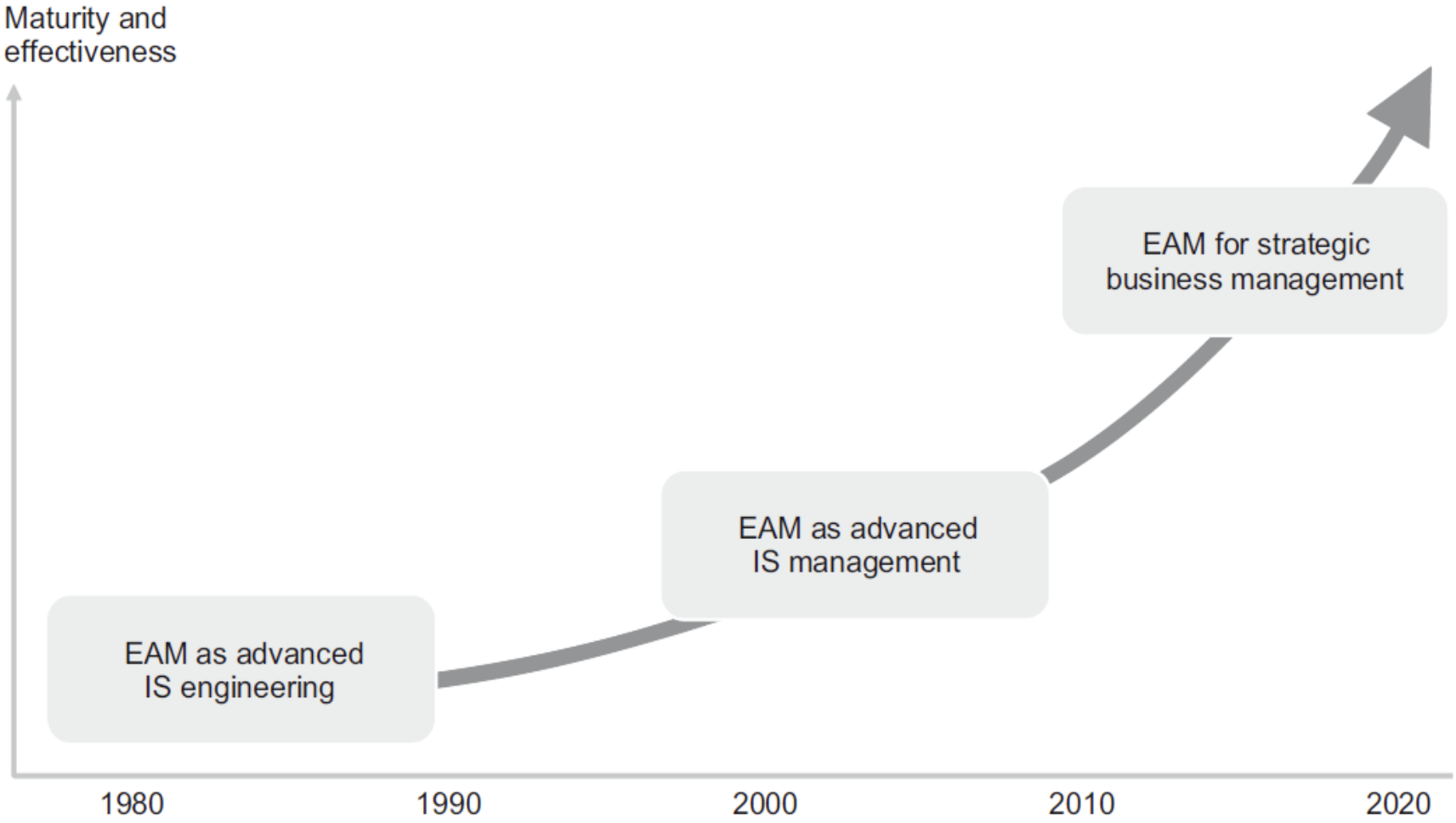
John Zachman

Source: https://www.zachman.com/about-us/about-john-a-zachman

EAM is a management practice that establishes, maintains and uses a coherent set of guidelines, architecture principles and governance regimes that provide direction for and practical help with the design and the development of an enterprise's architecture in order to achieve its vision and strategy.

(Ahlemann et al. 2012, p. 20)

EAM Development Phases - Overview



(Ahlemann et al. 2012, p. 13)

EAM Development Phases – Phase 1 and 2

- Phase 1: EAM for holistic engineering of information systems
  - Conceptual structure of Architecture (e.g. Zachman Framework)
- Phase 2: Advanced Information Systems Management
  - defining role models,
  - planning, implementation and controlling the processes for IT/IS landscape (not only single applications) and ensuring transparent decision-making
  - defining decision rights and accountabilities
  - Advanced EAM frameworks not only provided architectural artefacts and models, but also contained guidelines for EAM planning, implementation and controlling
  - Advanced EAM frameworks containing guidelines in addition to architectural artefacts and models (e.g. TOGAF with ADM)

EAM Development Phases – Phase 3

- Phase 3: Strategic Business Management
  - EAM is no longer understood as just an IT department job, but as a strategic function
  - EAM plays an important role in organizational transformation and development
  - Integrating EAM into the strategy development and strategy implementation processes results in strong synergies, improved decision making and faster strategic change.
  - Strategic decision-making is based on enterprise architecture information, and takes enterprise architecture-specific objectives and policies into account.
  - Adding motivation to Architecture Frameworks and guidelines

What EAM *IS*

- a holistic way to understand, plan, develop and control an organization's architecture (EAM as a management philosophy),
- a support function to enable and improve existing strategy planning and strategy implementation processes (EAM as an organizational function),
- a set of management practices that help to improve the quality of decision-making (EAM as a methodology),
- an open approach to reach consensus among managers on the basis of their shared vision of establishing a global optimum for the firm, free of local and personal egoism and opportunism (EAM as a culture).

What EAM *IS NOT*

- EAM is not a tool
- EAM is not just modeling of the enterprise architecture
- EAM is not an IT function
- EAM is not a new management process
  - EA includes a set of new management practices, but it does not produce new processes.
  - Instead, it merely changes the way existing processes/projects are run
- EAM is not strategy development
  - EAM is used in strategy management

ARCHIMATE 3.0.1 AND TOGAF

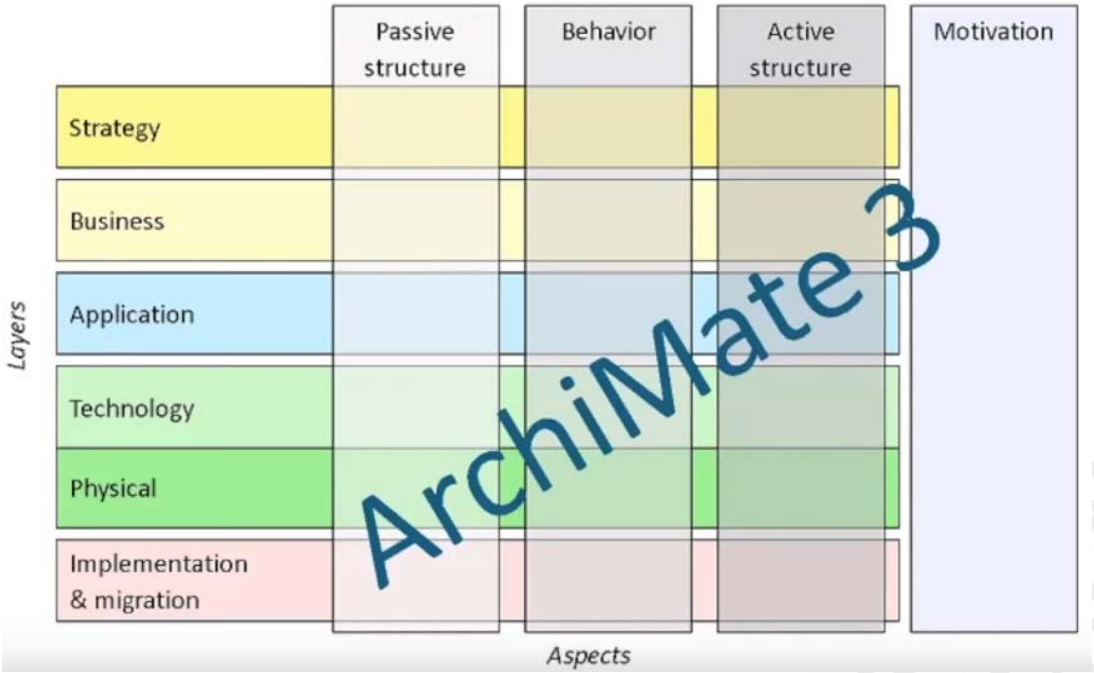
What ArchiMate provides

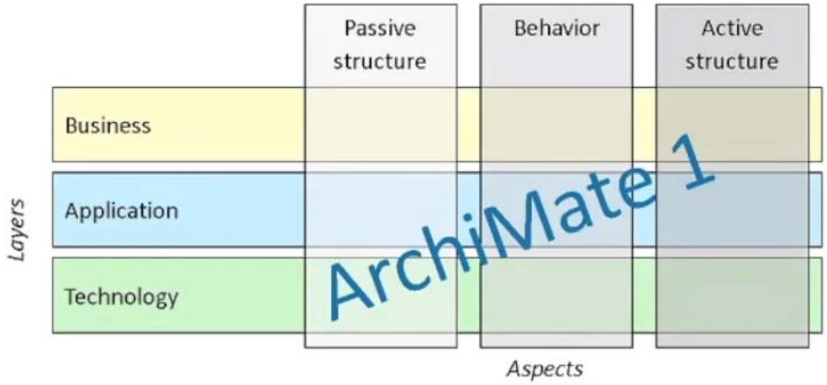
- A language with concepts to describe architectures
- A framework to organize these concepts
- A graphical notation for these concepts
- A vision on visualizations for different stakeholders
- An open standard maintained by the Open Group

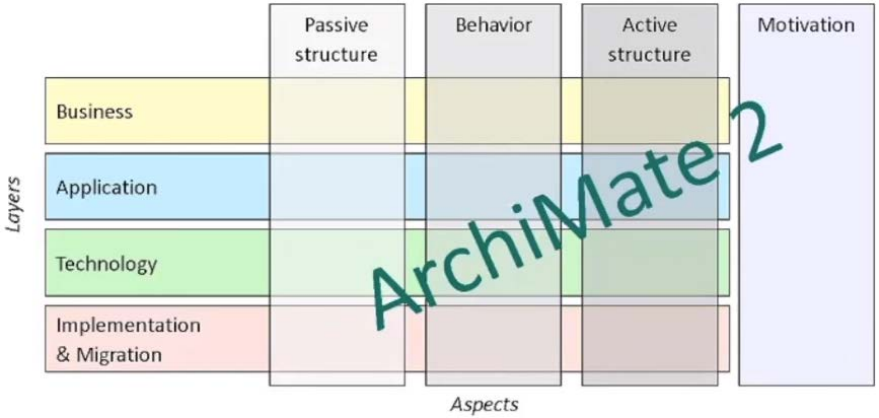
Why a new version of ArchiMate (i.e. why ArchiMate 3.0)?

- Increasing demand for relating EA to business strategy
- Technology applications that mix IT and physical world
- Usage in new domains, e.g. manufacturing, logistics
- Improved consistency and comprehensibility
- Improved alignment between ArchiMate and TOGAF

Evolution of the ArchiMate Framework

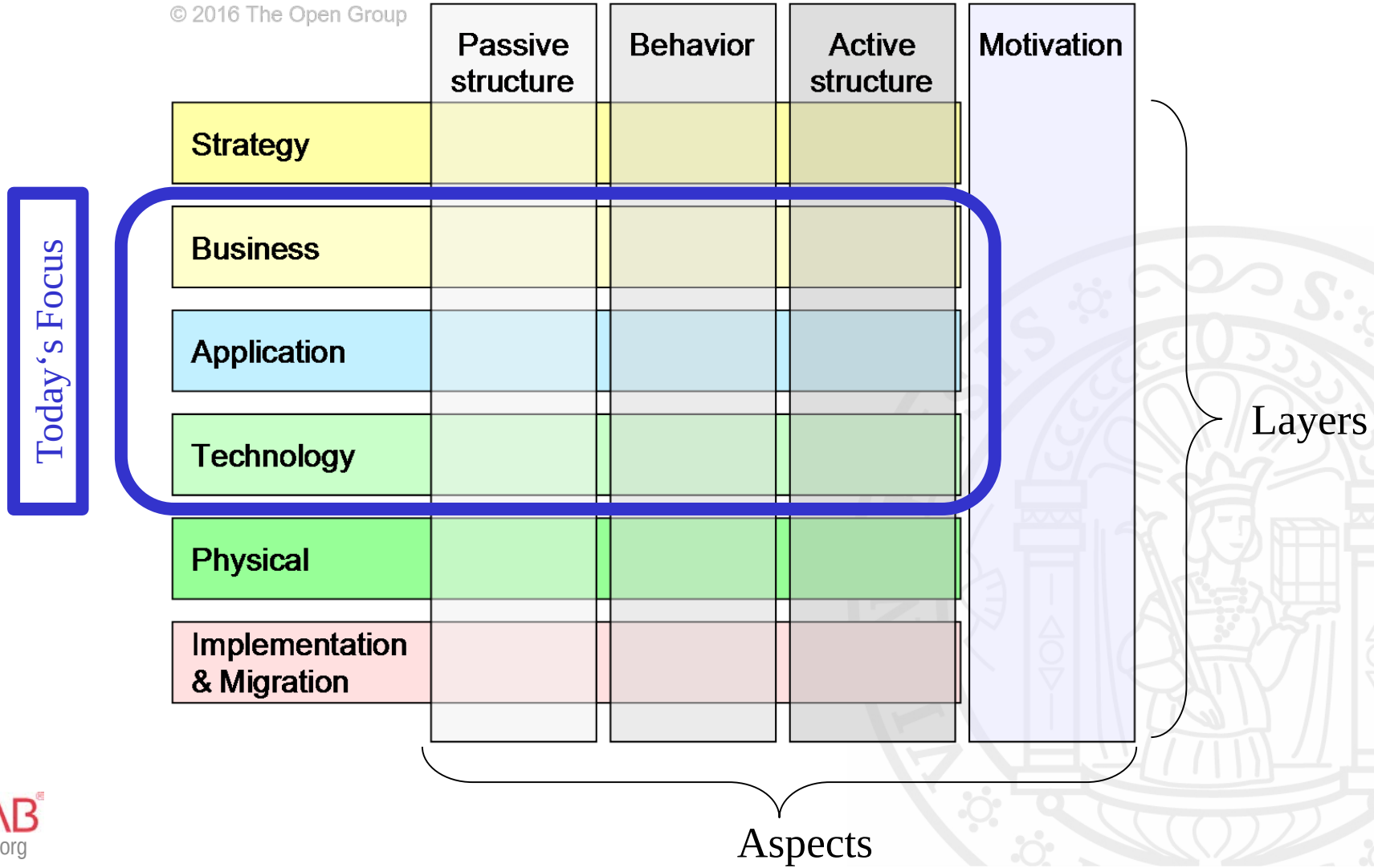






ArchiMate 3 Core

- This presentation focusses on the elements of the ArchiMate Core Framework - Business, Application, and Technology.



ArchiMate 3 Layers [1/2]

"An abstraction of the ArchiMate framework at which an enterprise can be modeled" *(ArchiMate 3.0.1, p. 4)*

- Business Layer
  - business services offered to customers, which are realized in the organization by business processes performed by business actors.
- Application Layer
  - application services that support the business, and the applications that realize them.
- Technology Layer
  - technology services such as processing, storage, and communication services needed to run the applications
  - computer and communication hardware and system software that realize those services.
  - Physical elements for modeling physical equipment, materials, and distribution networks (new in ArchiMate 3)

ArchiMate 3 Layers [2/2]

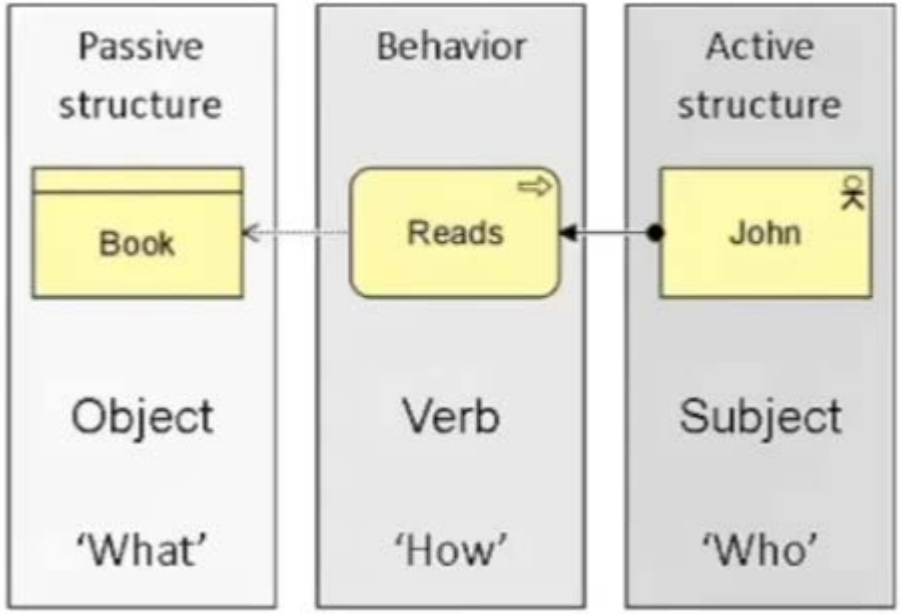
- Strategy Layer
  - An ability that an active structure element, such as an organization, person, or system, possesses. An approach or plan for configuring some capabilities and resources of the enterprise, undertaken to achieve a goal. An asset owned or controlled by an individual or organization.
  - Capability, Resource, Course of Action.
- Physical Layer
  - This layer provides and overview of the physical elements and their relationships, derived from the ArchiMate Technology layer.
  - Equipment, Facility, Distribution network, Material
- Implementation & Migration Layer
  - Focusing on the actual implementation of an EA and the migration process with work packages and dependencies.
  - Work package, Deliverable, Implementation event, Plateau, Gap

ArchiMate 3 Aspects

- Active Structure
  - represents the structural elements (the business actors, application components, and devices that display actual behavior).
- Behavior
  - represents the behavior (processes, functions, events, and services) performed by the actors.
  - Structural elements are assigned to behavioral elements, to show who or what displays the behavior.
- Passive Structure
  - represents the objects on which behavior is performed. These are usually information objects in the Business Layer and data objects in the Application Layer, but physical objects.
- Motivation
  - Motivation elements are used to model the motivations, or reasons, that guide the design or change of an Enterprise Architecture.

Core Aspects in ArchiMate 3

- Aspects correspond to a Subject-Verb-Object of sentences:



Abstractions in ArchiMate [1/2]

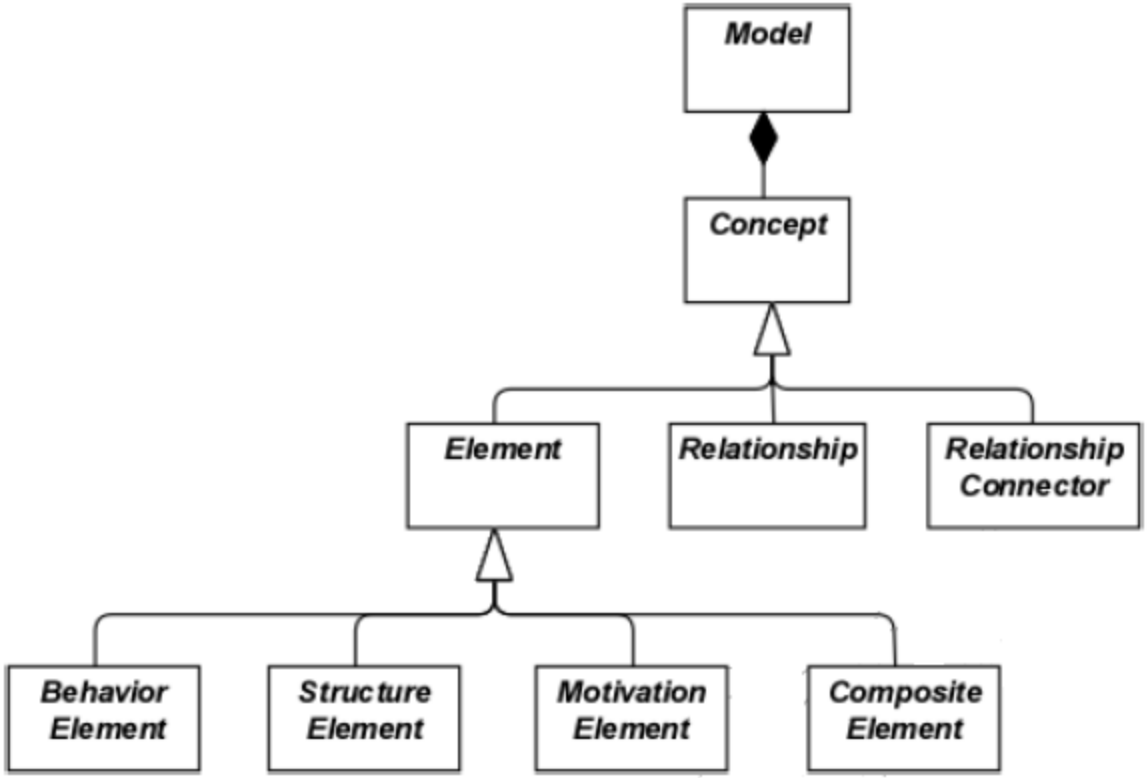
- Separate Behavior from active structure
  - Behavior: what the system must do and how the system does it
  - Active structure: the system constituents (people, applications, and infrastructure) that do it
- External vs. internal behavior :
  - External view: what the system has to do for its environment (e.g. a service)
  - Internal view: how it does this (e.g. the process or application realizing the service)

Abstractions in ArchiMate [2/2]

- Conceptual, logical, and physical abstraction levels
  - conceptual elements represent the information the business finds relevant;
  - logical elements provide logical structure to this information for manipulation by information systems;
  - physical elements describe the storage of this information; for example, in the form of files or database tables.
- In the ArchiMate language, this corresponds with business objects, data objects, and artifacts, and the realization relationships between them

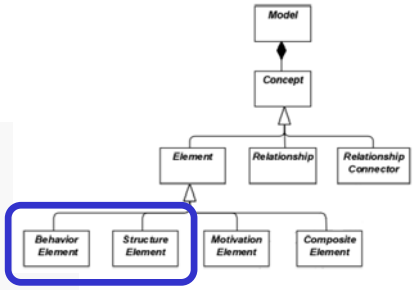
ArchiMate Generic Metamodel

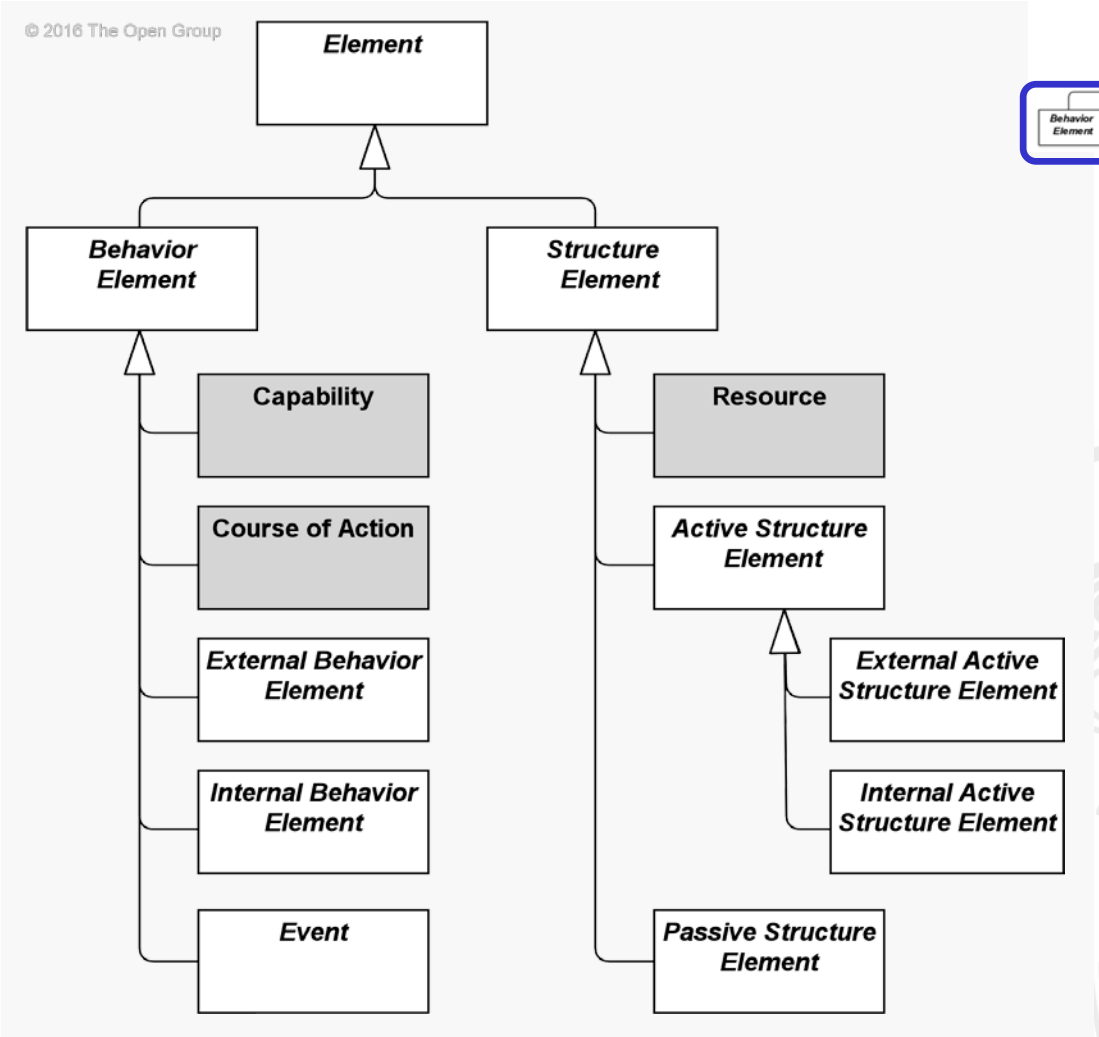
Top-level hierarchy of ArchiMate Concepts.



Archimate 3.0.1 Specification, page 6

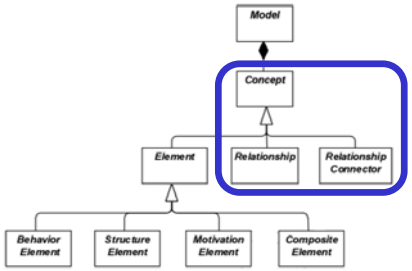
Hierarchy of Behaviour and Structure Elements

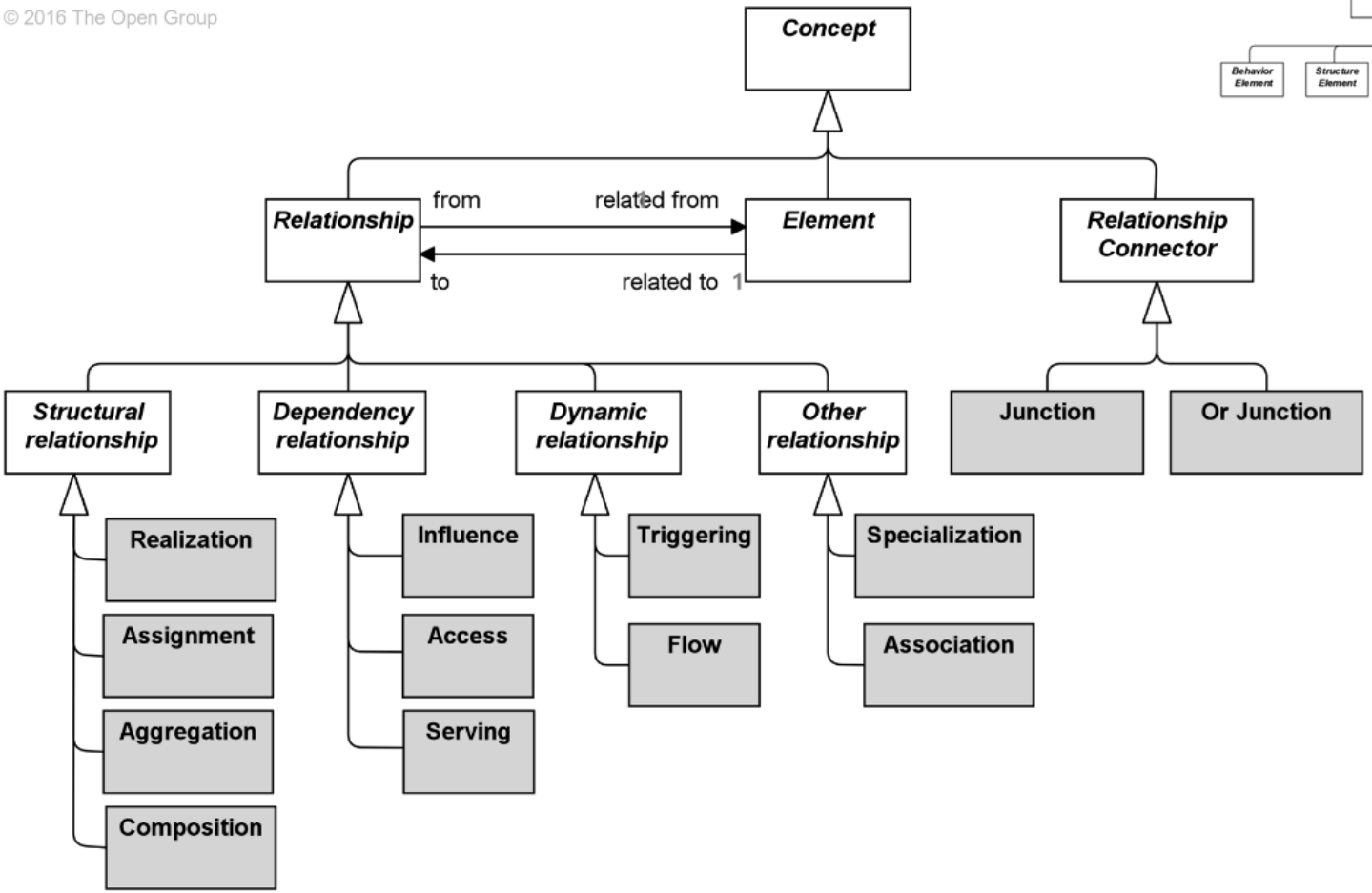




ArchiMate 3, section 4.1

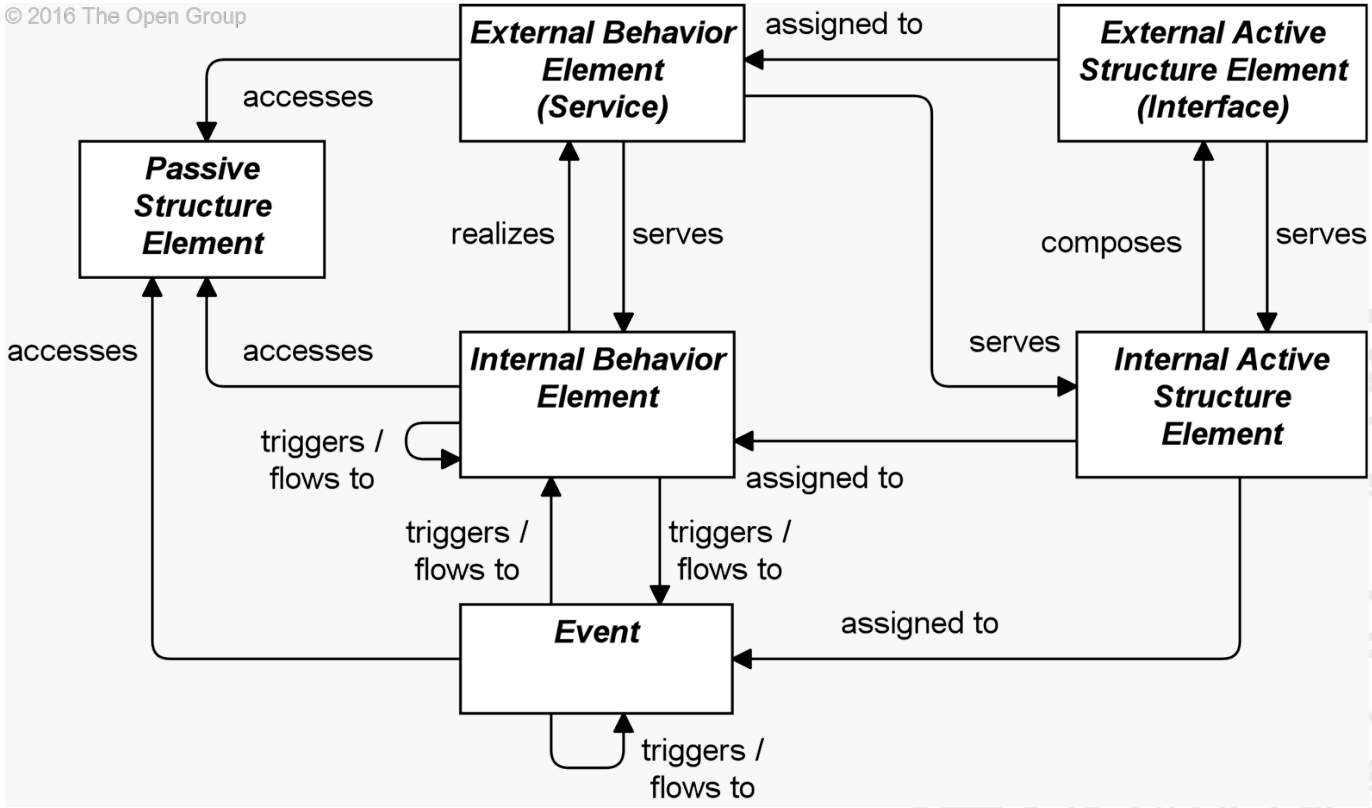
Overview of ArchiMate 3 Relationships





ArchiMate 3, section 5

ArchiMate 3: Core Concepts and Relationships



external

internal

Passive structure

Behavior

Active structure

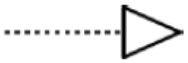
ArchiMate 3, section 4.1

Notational Encodings in ArchiMate 3

Although not strictly enforced, ArchiMate 3 comes with a set of 'notational best-practices'

- Color-encoding of Layers, e.g.:
  - Yellow for the Business Layer
  - Blue for the Application Layer
  - Green for the Technology Layer
- Shape-encoding of Aspects, e.g.:
  - Square corners are used to denote structure elements.
  - Round corners are used to denote behavior elements.
  - Diagonal corners are used to denote motivation elements.

ArchiMate Relationships: Overview [1/3]

Structural Relationships		Notation
Composition	Indicates that an element consists of one or more other concepts.	
Aggregation	Indicates that an element consists of one or more other concepts.	
Assignment	Expresses the allocation of responsibility, performance of behavior, or execution.	
Realization	Indicates that an entity plays a critical role in the creation, achievement, sustenance, or operation of a more abstract entity.	

ArchiMate 3.0.2, Section 5

ArchiMate Relationships: Overview [2/3]

Dependency Relationships		Notation
Serving	Models that an element provides its functionality to another element.	
Access	Models the ability of behavior and active structure elements to observe or act upon passive structure elements.	
Influence	Models that an element affects the implementation or achievement of some motivation element.	+/-

Dynamic Relationships		Notation
Triggering	Describes a temporal or causal relationship between elements.	
Flow	Transfer from one element to another.	

ArchiMate 3.0.2, Section 5

ArchiMate Relationships: Overview [3/3]

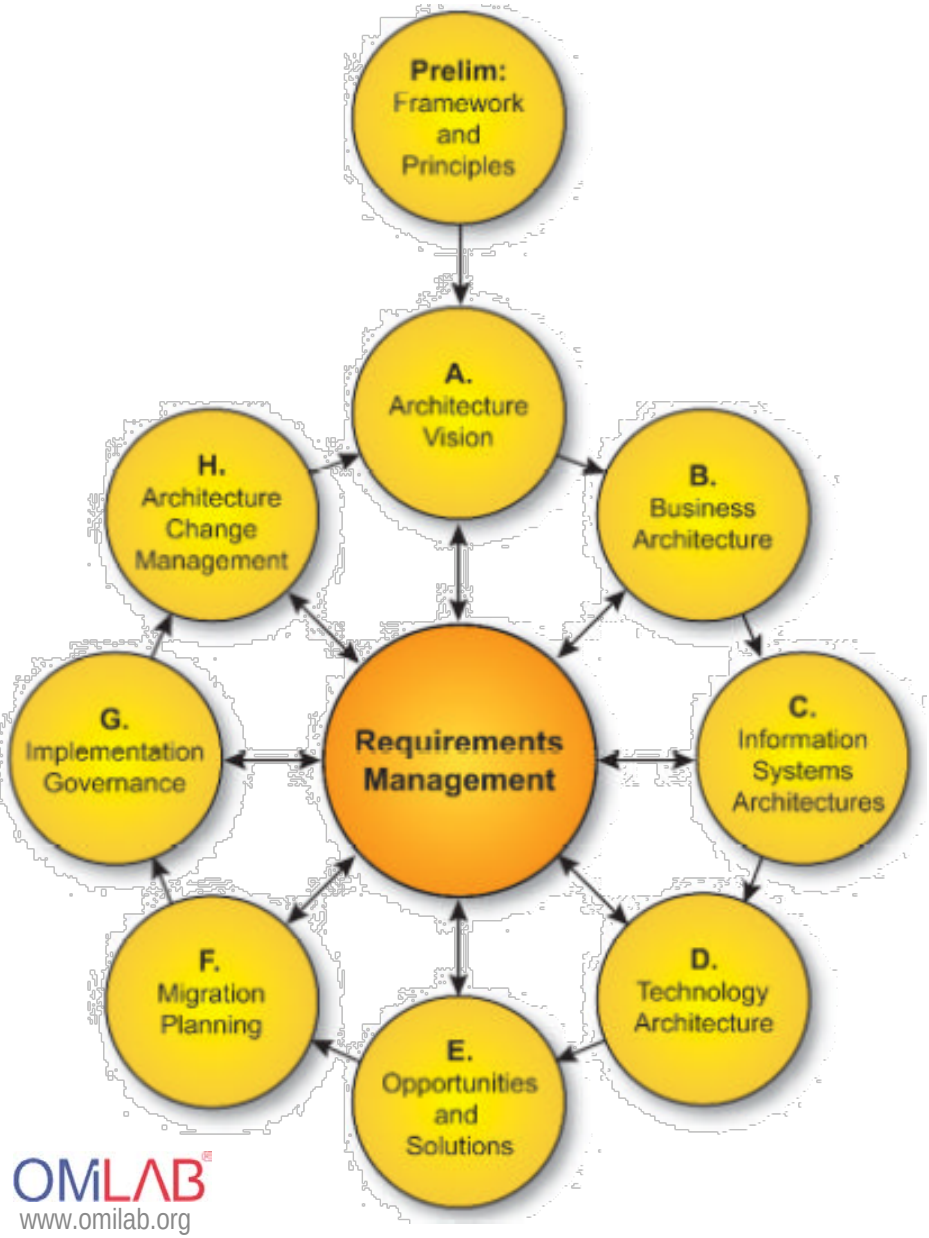
Other Relationships		Notation
Specialization	Indicates that an element is a particular kind of another element.	
Association	Models an unspecified relationship, or one that is not represented by another ArchiMate relationship.	
Junction	Used to connect relationships of the same type.	(And) Junction Or Junction

ArchiMate 3.0.2, Section 5

The Open Group Architecture Framework (TOGAF)

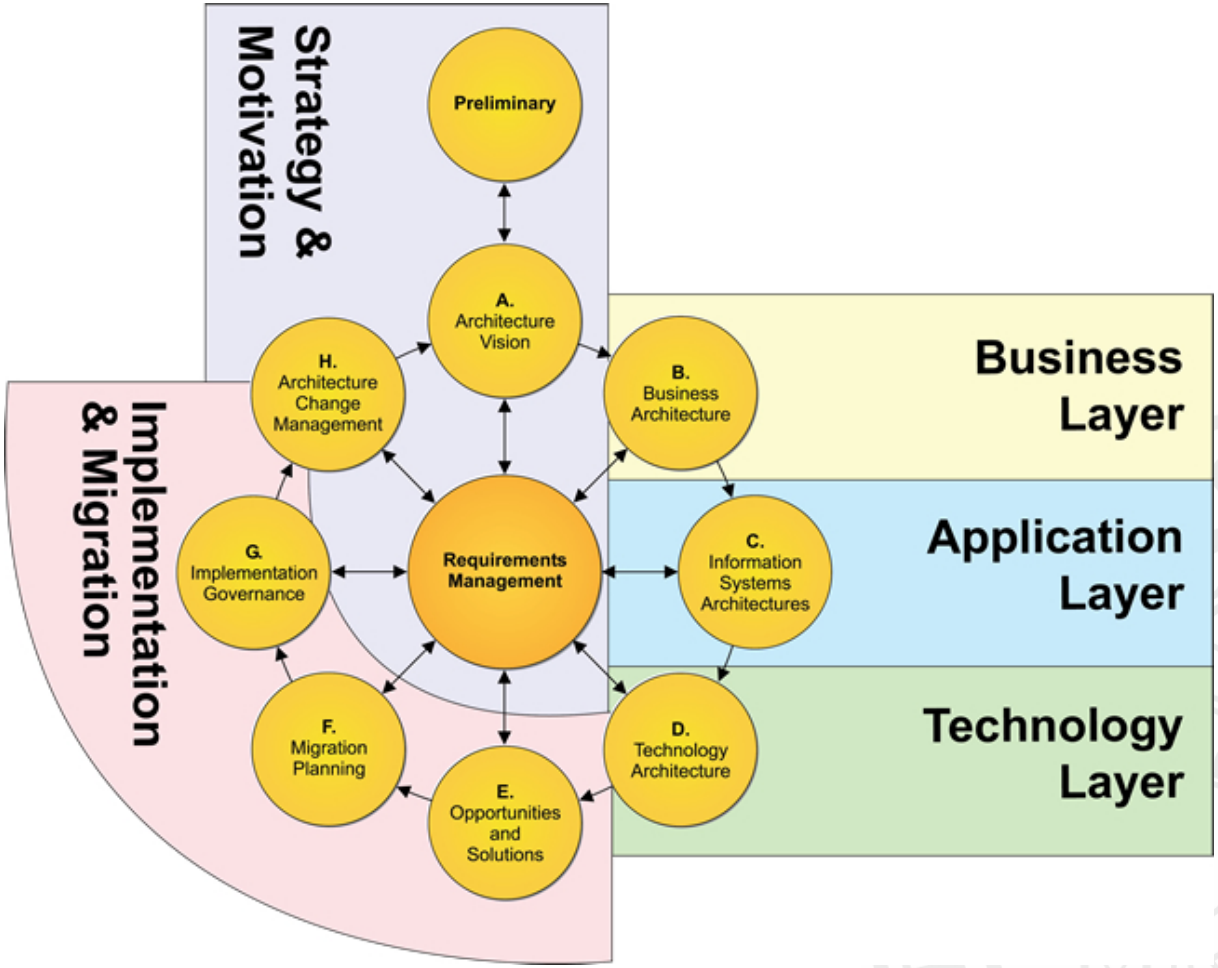
- "TOGAF is an architecture framework - The Open Group Architecture Framework. It enables you to design, evaluate, and build the right architecture for your organization." [TOGAF]
- Vendor-neutral – i.e. TOGAF realizes a consensus of the consortium
- Provides an overarching methodology for the development of architectures (ADM)
- Fosters a common understanding among stakeholders by introducing a generally agreed-upon terminology, utilization of best practices, and the postulation of objectives.
- Integration and interoperability of IT systems is supported with a focus on the Business-IT-Alignment and the effects of architecture changes on business.

Enterprise Architecture Development Method



- The core of TOGAF
- A proven way of developing an architecture
- Specifically designed to address business requirements
- An iterative method
- A set of architecture views to ensure that a complex set of requirements are adequately addressed

Combining ArchiMate 3 and TOGAF



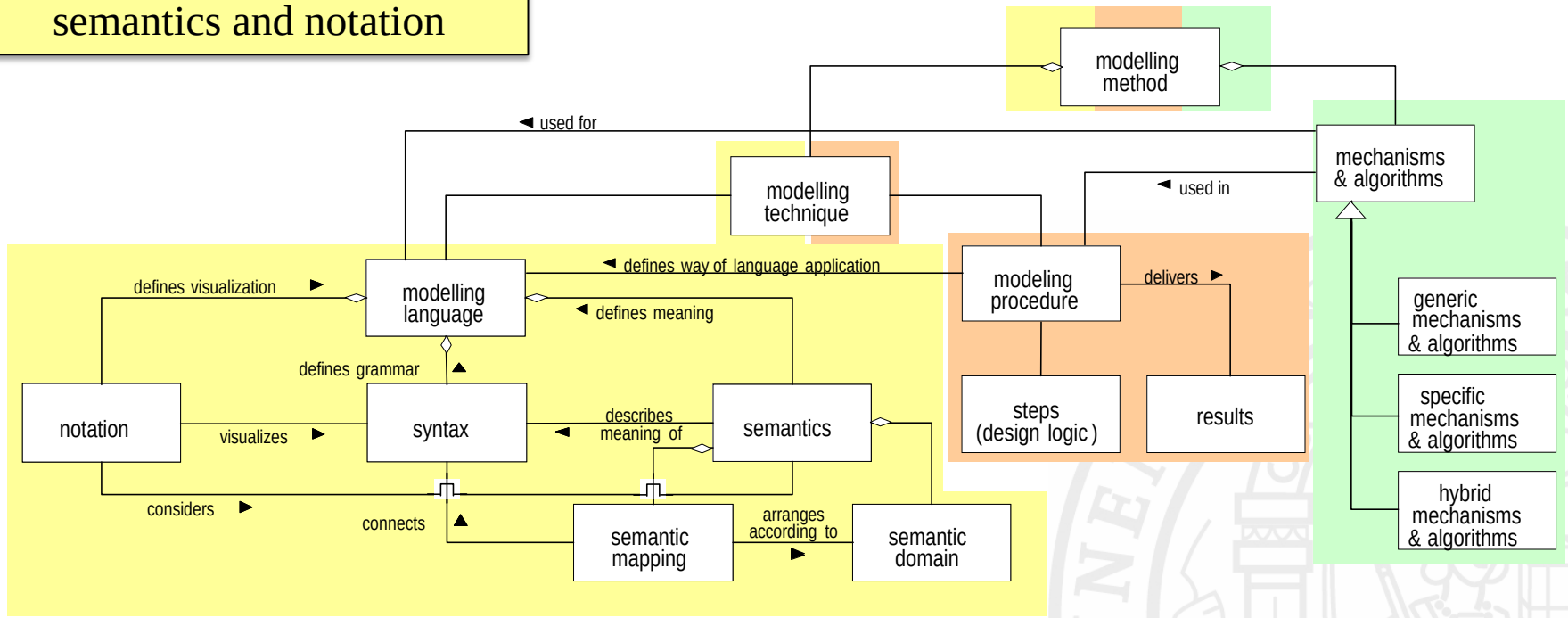
Source: http://www.opengroup.org/subjectareas/enterprise/archimate/3.0-whats-new

So how can we *Do* EAM in the practice? [1/2]

An analysis of the status quo:

the ***modeling language*** that describes the syntax, semantics and notation

algorithms and mechanisms that provide *"functionality to use and evaluate"* models described by a modeling language



the ***modeling procedures*** that guides the application of the methodology

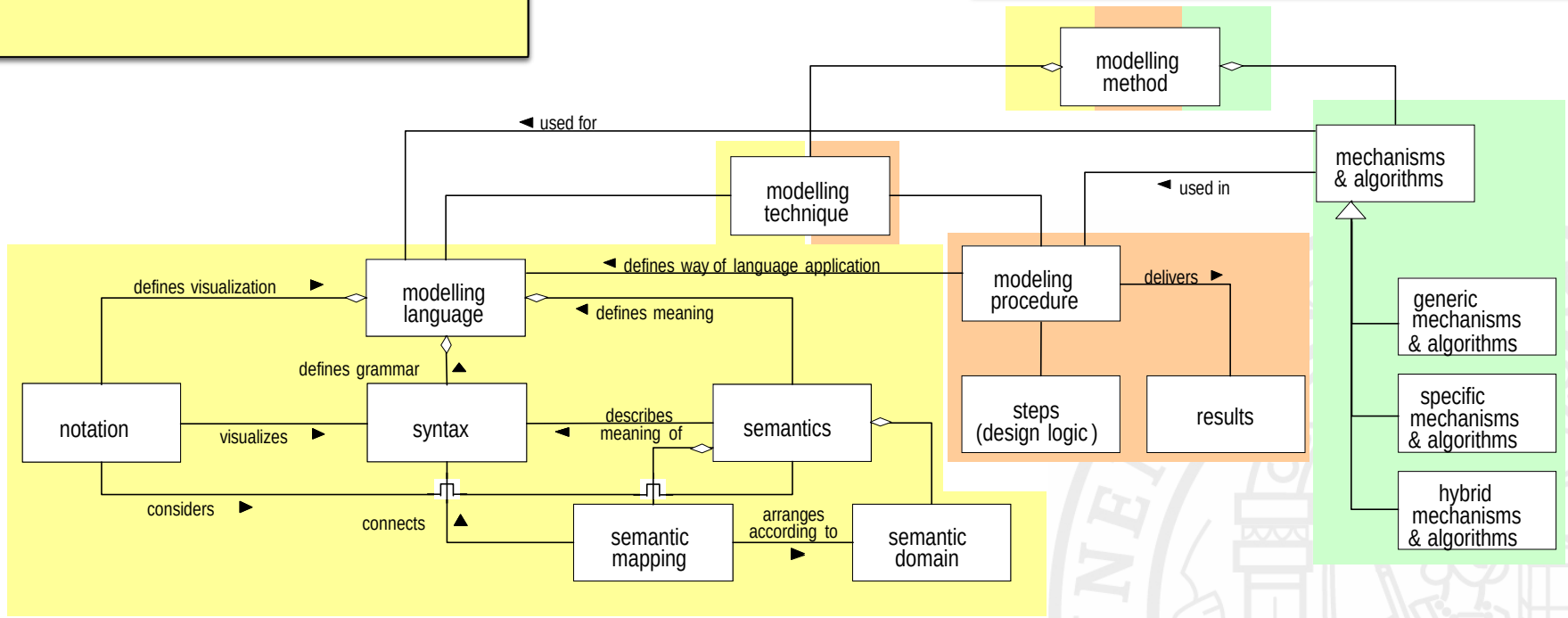
Reference: Karagiannis, D., Kühn, H.: „Metamodelling Platforms". In Bauknecht, K., Min Tjoa, A., Quirchmayer, G. (Eds.): Proceedings of the Third International Conference EC-Web 2002 – Dexa 2002, Aix-en-Provence, France, September 2002, LNCS 2455, Springer, Berlin/Heidelberg, p. 182 ff.

So how can we *Do* EAM in the practice? [2/2]

An analysis of the status quo:

?
?
?

ArchiMate



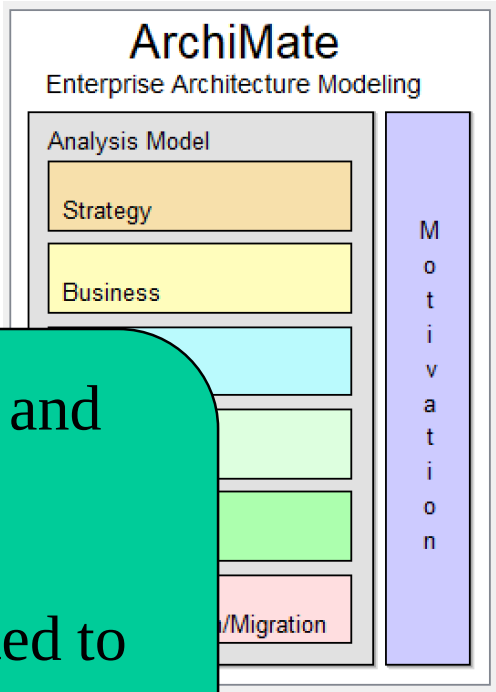
TOGAF

Reference: Karagiannis, D., Kühn, H.: „Metamodelling Platforms“. In Bauknecht, K., Min Tjoa, A., Quirchmayer, G. (Eds.): Proceedings of the Third International Conference EC-Web 2002 – Dexa 2002, Aix-en-Provence, France, September 2002, LNCS 2455, Springer, Berlin/Heidelberg, p. 182 ff.

EAM CASE STUDY

TOGAF-based Enterprise Architecture Management Tool - *TEAM*

http://austria.omilab.org/psm/content/team/info



- The TEAM tool has the following features
  - Full support of ArchiMate 3.0.1
  - All ArchiMate laye
  - An Analysis Mod language
  - Aiming for a mar with functionality
    - Information M
    - Responsibility
    - Business Continuity Management
    - Lifecycle Management

The TEAM tool is open use and open source.

Please join if you are interested to contribute to the further development!!

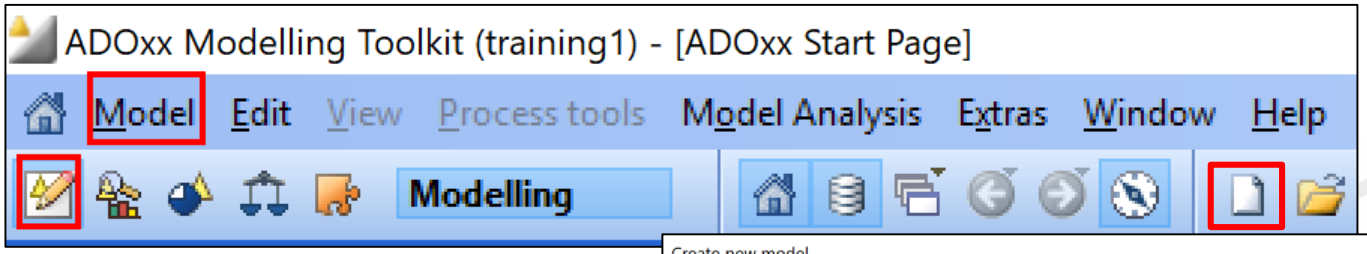
Structure and Tasks of the Case Study

1. Introduction to the TEAM modelling tool
2. Introduction to ArchiMate 3 Business Layer Modeling
   - Create a Business Layer model in the TEAM tool
3. Introduction to ArchiMate 3 Technology Layer Modeling
   - Create a Technology Layer model in the TEAM tool
4. Introduction to ArchiMate 3 Application Layer Modeling
   - Create a Application Layer model in the TEAM tool
5. Advanced Management Capabilities with ArchiMate

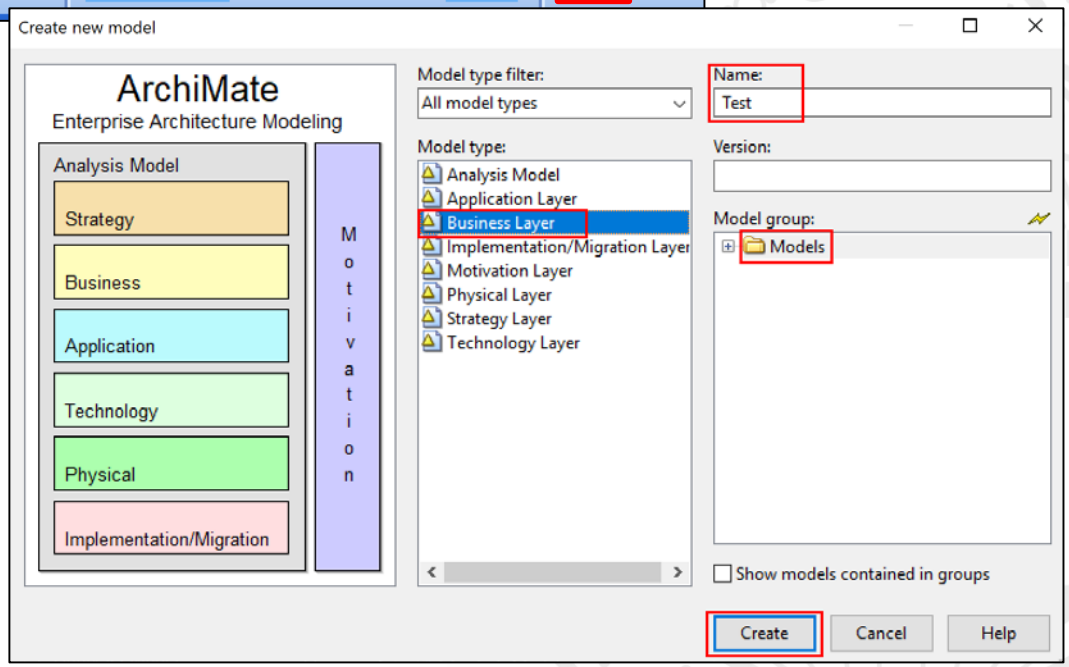
1. INTRODUCTION TO THE TEAM MODELING TOOL

How to create a new model?

- Start the TEAM Modeling Tool
- The creation of a new model is always the same (does not depend on model type)
- Choose the modeling component (sheet and pen icon)
- Model -> new

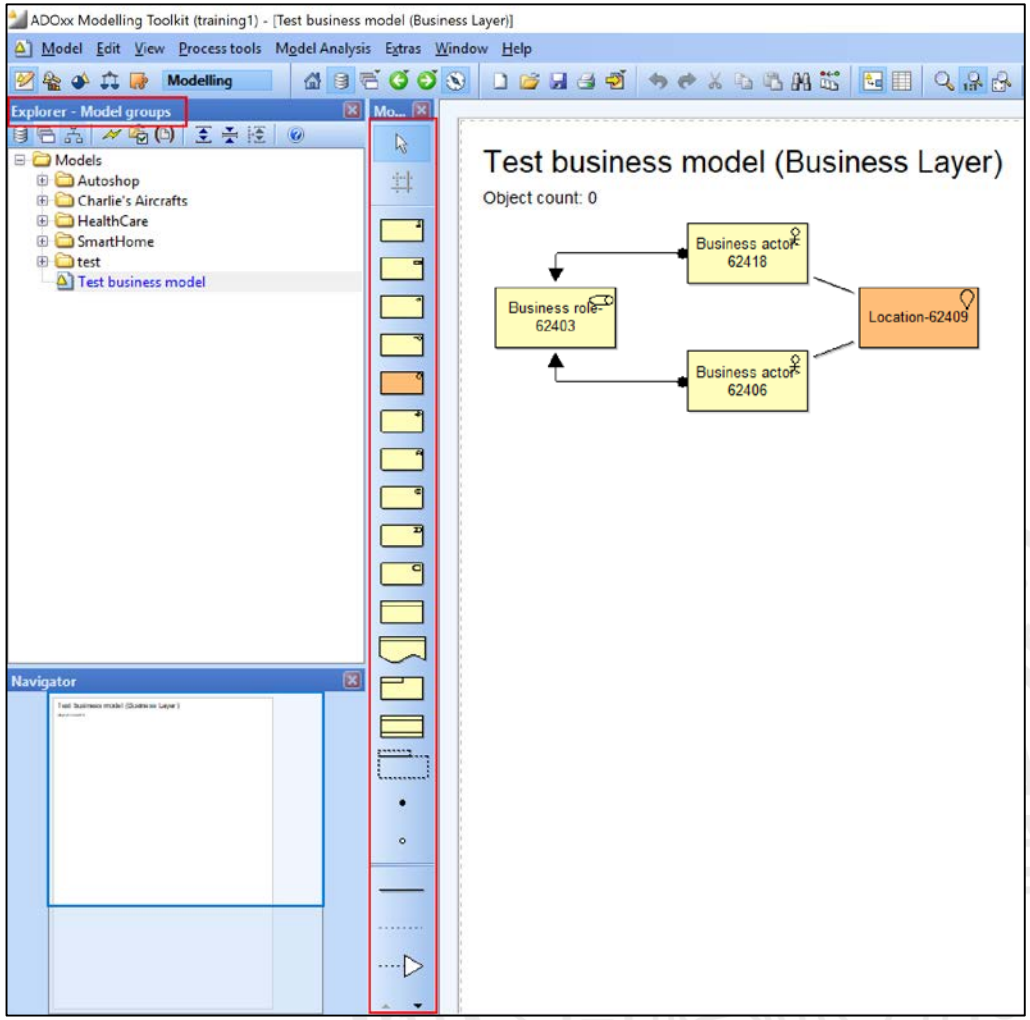


- Choose the model type
- Choose a name
- Choose a folder



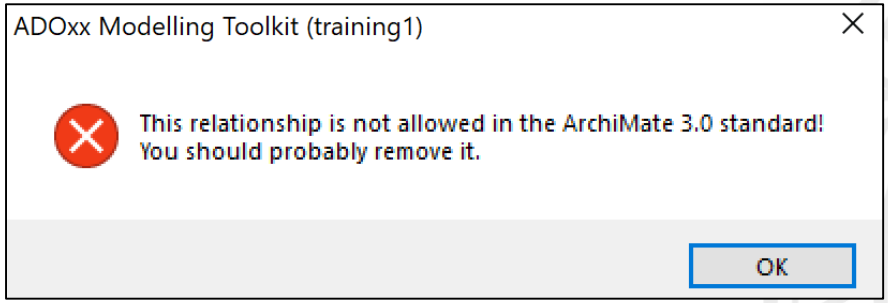
How to model (1/2): Objects

- All models can be seen in the explorer
- Select (click on it) any element from the element bar in the middle -> a pen arises when the cursor is shifted to the modeling area -> place (another click) it anywhere
- The cursor on the top of the element bar de-selects the element -> elements can be shifted after deselection



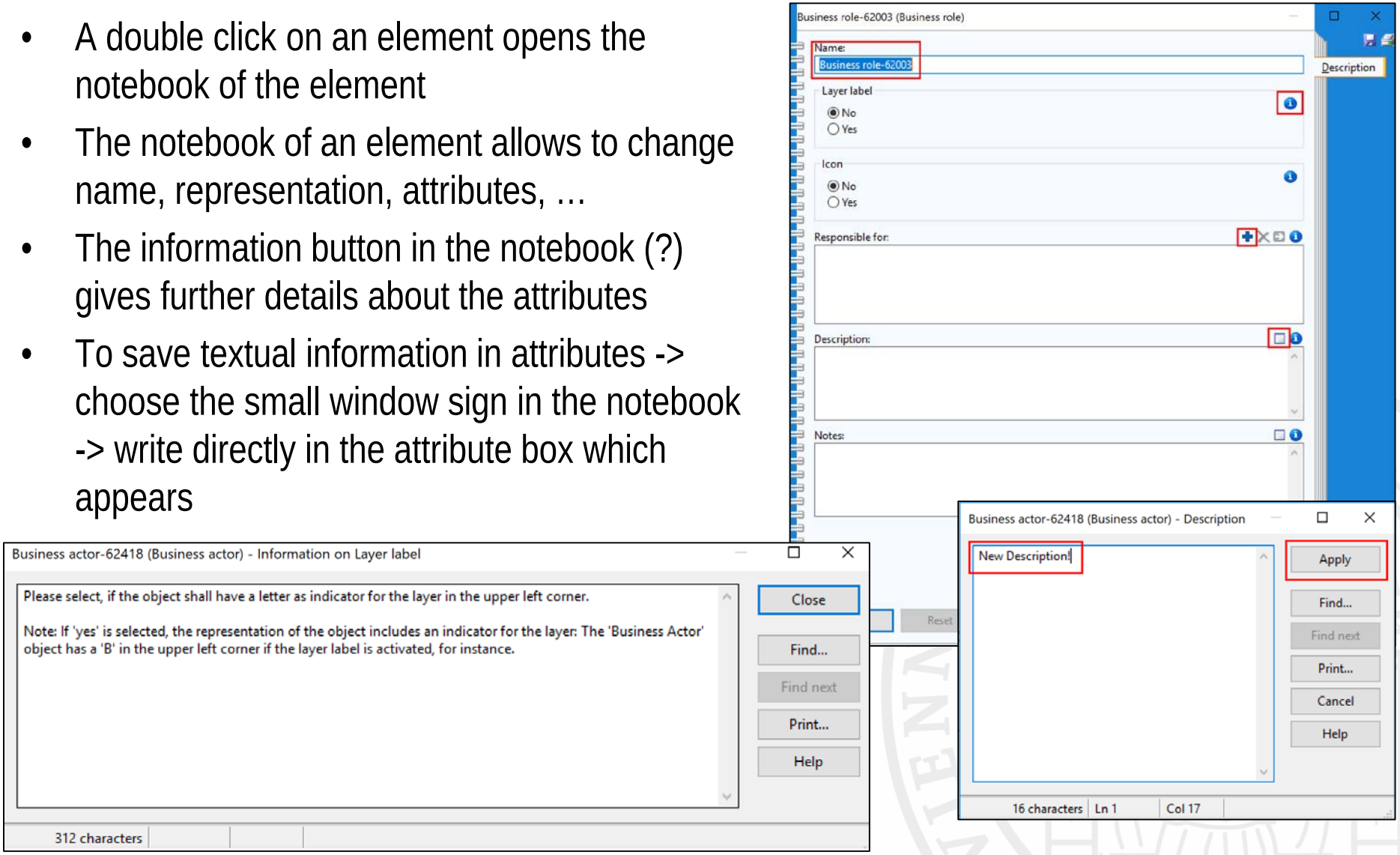
How to model (2/2): Connectors

- Select (click on it) any relation from the element bar in the middle -> a pen arises when the cursor is shifted to the modeling area -> select the first element (click) -> select the second element (click)
- The cursor on the top of the element bar deselects the chosen relationship -> elements can be shifted after deselection
- Some connections between elements are not allowed -> information message appears



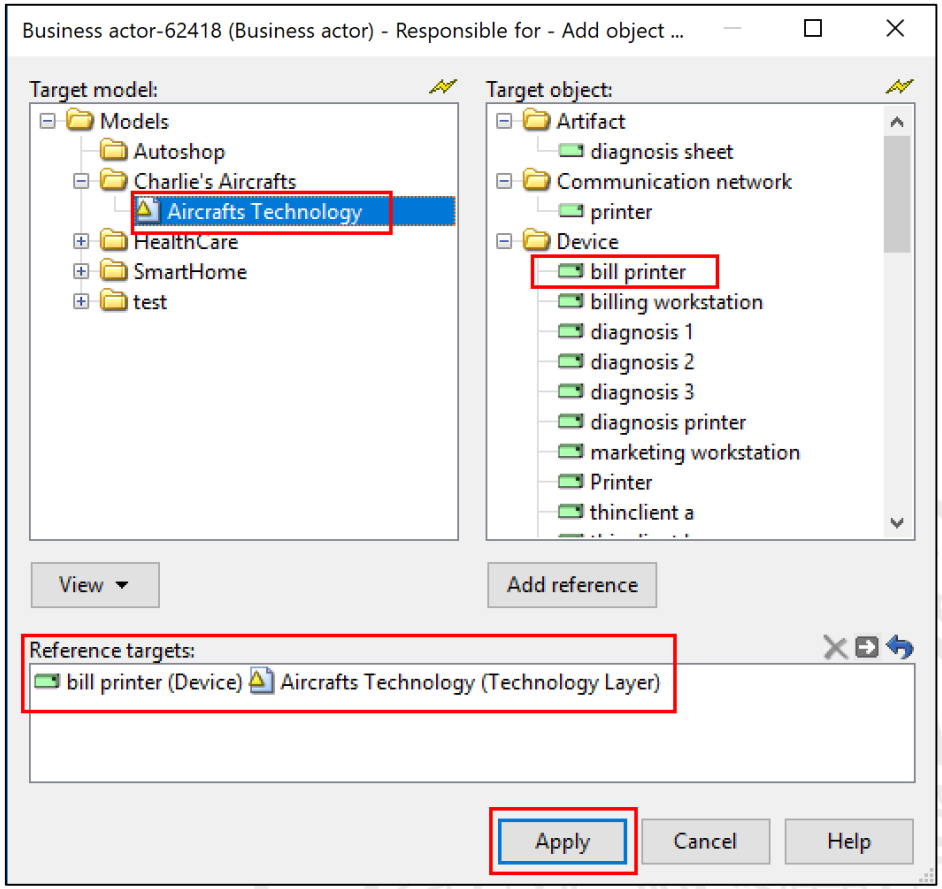
How to define properties of an element? [1/2]

- A double click on an element opens the notebook of the element
- The notebook of an element allows to change name, representation, attributes, …
- The information button in the notebook (?) gives further details about the attributes
- To save textual information in attributes -> choose the small window sign in the notebook -> write directly in the attribute box which appears



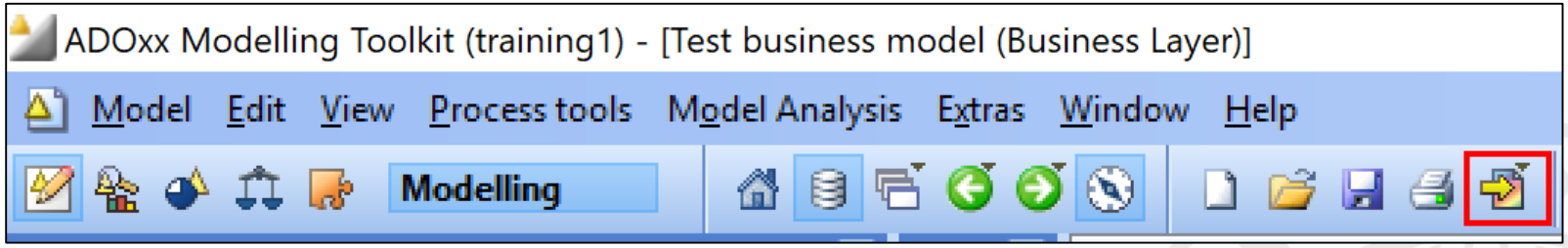
How to define properties of an element? [2/2]

- Interrefs (Connectors between elements of different models) can be created with the + sign in the notebook
- A dialog window appears
  - Choose the target model
  - Choose the target object (double click)
  - The referenced elements are shown at the bottom of the window
  - After choosing all references confirm with the apply button



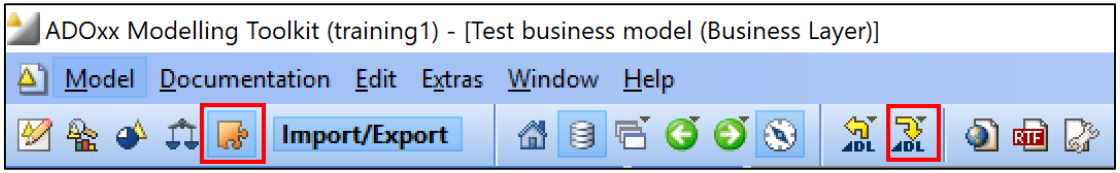
How to export models? (1)

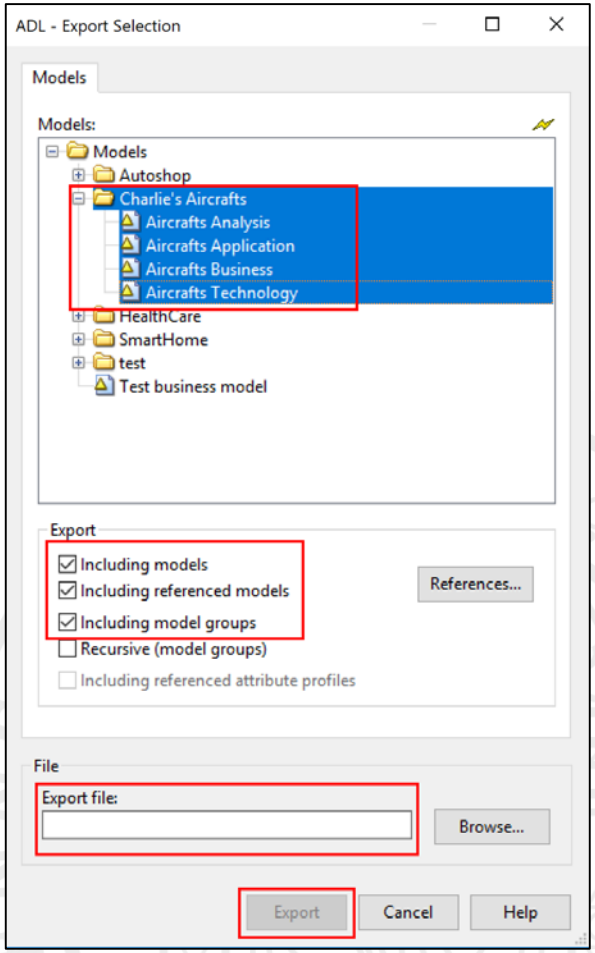
- Export a graphic of the model by choosing the “Export” button
- Follow the dialog window (the size and the picture format can be chosen)



How to export models? (2)

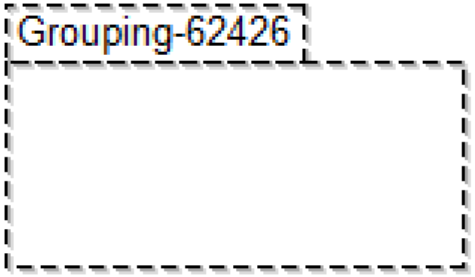
- Export an ADL file (can be imported by other TEAM users) of the model(s)
- Choose import/export -> ADL export
- Follow the dialog window: choose the models and the folder, tick the including sections, choose a path for the export, confirm with the export button



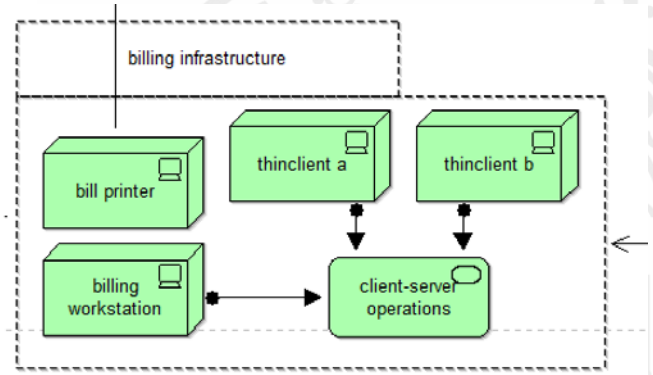


How to use grouping?

- According to the ArchiMate Specification the grouping element aggregates or composes concepts that belong together based on some common characteristic.



- In the technology layer model, the grouping element is used to visualize similarity regarding the content of the elements -> it is not used to show aggregation or composition in this case.



2. INTRODUCTION TO ARCHIMATE 3 BUSINESS LAYER MODELING

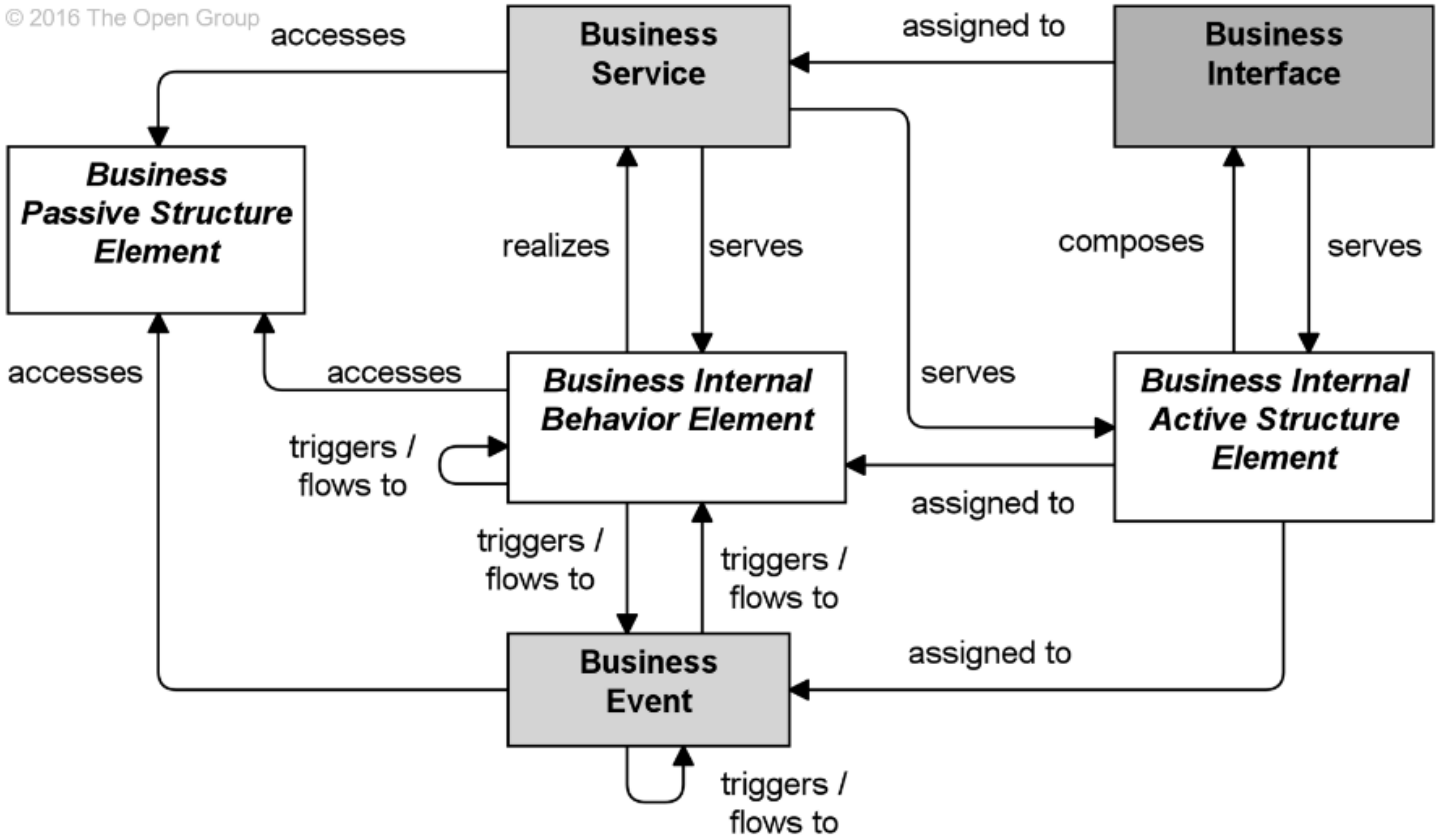
Charlie‘s Aircrafts

Charlie offers sightseeing flights with helicopters and sailplanes for tourists as well as for interested locals. The planes are serviced internally. He has built an impressive client base all over the state, has a well-stocked inventory and a well-running organization with 20 employees (Charlie + 5 mechanics + 10 pilots + 4 employees for office activities).

Charlie is nearing his retirement age and plans to give his business to Peter, his nephew. While the prospect of running an established business is appealing to Peter, a recent business school graduate, he is also aware that he has absolutely no knowledge of planes. Most importantly he has also no interest in learning about them.

Peter dreams of running a large company, thus after a thorough study of his uncle’s business he decides the following: Peter will expand the business and introduce new services. Helicopter and sailplane sightseeing flights remain with slight changes. A multilingual tourist guide should improve the communication with tourists from abroad. Instead of repairing only company owned planes, Peter will rent out the repair center to plane enthusiasts who want to repair their planes by themselves. He will focus on old planes and offer an intermediary service for rare parts. Three service packages (basic, silver, gold) for clients with own aircrafts will be offered. As a service for the customers he will provide space, the machines and tools as well as the expertise of two mechanics on an hourly basis. New holding areas will provide space for external planes. For a fee, private aircrafts can be shed in company owned warehouses. These customers can also use the runway for take-off and landing for a reduced fee. Furthermore, the service package is expanded by flight lessons. A teacher, who explains the technology of aircrafts as well as the traffic rules and conducts short training flights, can be booked on daily basis.

ArchiMate 3 Business Layer Metamodel



external

internal

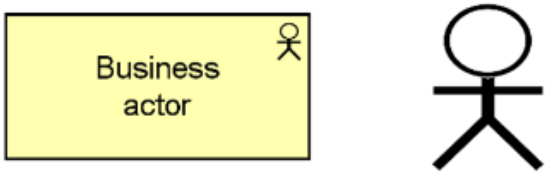
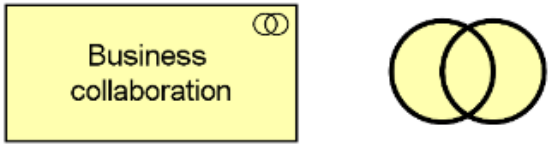
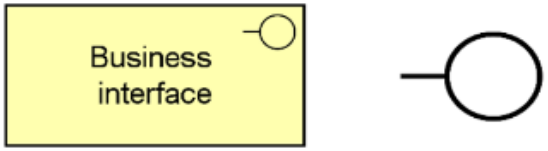
Passive structure

Behavior

Active structure

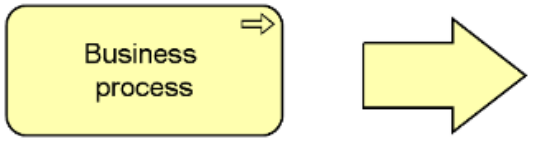
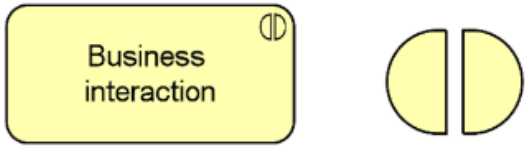
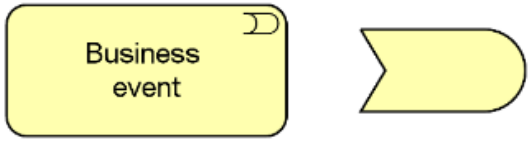
ArchiMate 3, section 8

ArchiMate 3 Business Layer Concepts [1/3]

Element	Description	Notation
Business actor	A business entity that is capable of performing behavior.	
Business role	The responsibility for performing specific behavior, to which an actor can be assigned, or the part an actor plays in a particular action or event.	
Business collaboration	An aggregate of two or more business internal active structure elements that work together to perform collective behavior.	
Business interface	A point of access where a business service is made available to the environment.	

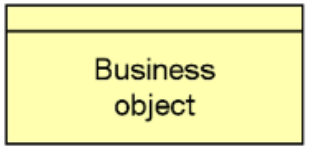
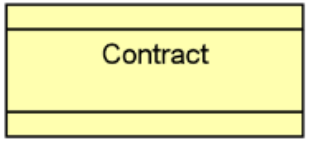
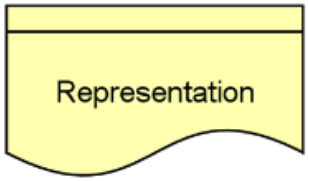
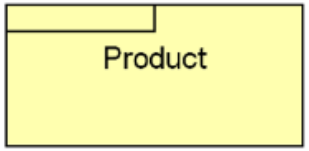
ArchiMate 3, section 8

ArchiMate 3 Business Layer Concepts [2/3]

Business process	A sequence of business behaviors that achieves a specific outcome such as a defined set of products or business services.	
Business function	A collection of business behavior based on a chosen set of criteria (typically required business resources and/or competences), closely aligned to an organization, but not necessarily explicitly governed by the organization.	
Business interaction	A unit of collective business behavior performed by (a collaboration of) two or more business roles.	
Business event	A business behavior element that denotes an organizational state change. It may originate from and be resolved inside or outside the organization.	
Business service	An explicitly defined exposed business behavior.	

ArchiMate 3, section 8

ArchiMate 3 Business Layer Concepts [3/3]

Business object	A concept used within a particular business domain.	
Contract	A formal or informal specification of an agreement between a provider and a consumer that specifies the rights and obligations associated with a product and establishes functional and non-functional parameters for interaction.	
Representation	A perceptible form of the information carried by a business object.	
Product	A coherent collection of services and/or passive structure elements, accompanied by a contract/set of agreements, which is offered as a whole to (internal or external) customers.	

ArchiMate 3, section 8

Case Study Tasks: Business Layer

- Create a new Business Model in the TEAM tool.
- Identify the business elements
  - actor,
  - role,
  - collaboration,
  - process,
  - function,
  - interaction,
  - event,
  - service,
  - product, … and model them.
- Connect the different elements with the relations.

Business Layer: Actor Role Process/Service ....

Charlie offers sightseeing flights with helicopters and sailplanes for tourists as well as for interested locals. The planes are serviced internally. He has built an impressive client base all over the state, has a well-stocked inventory and a well-running organization with 20 employees (Charlie + 5 mechanics + 10 pilots + 4 employees for office activities).

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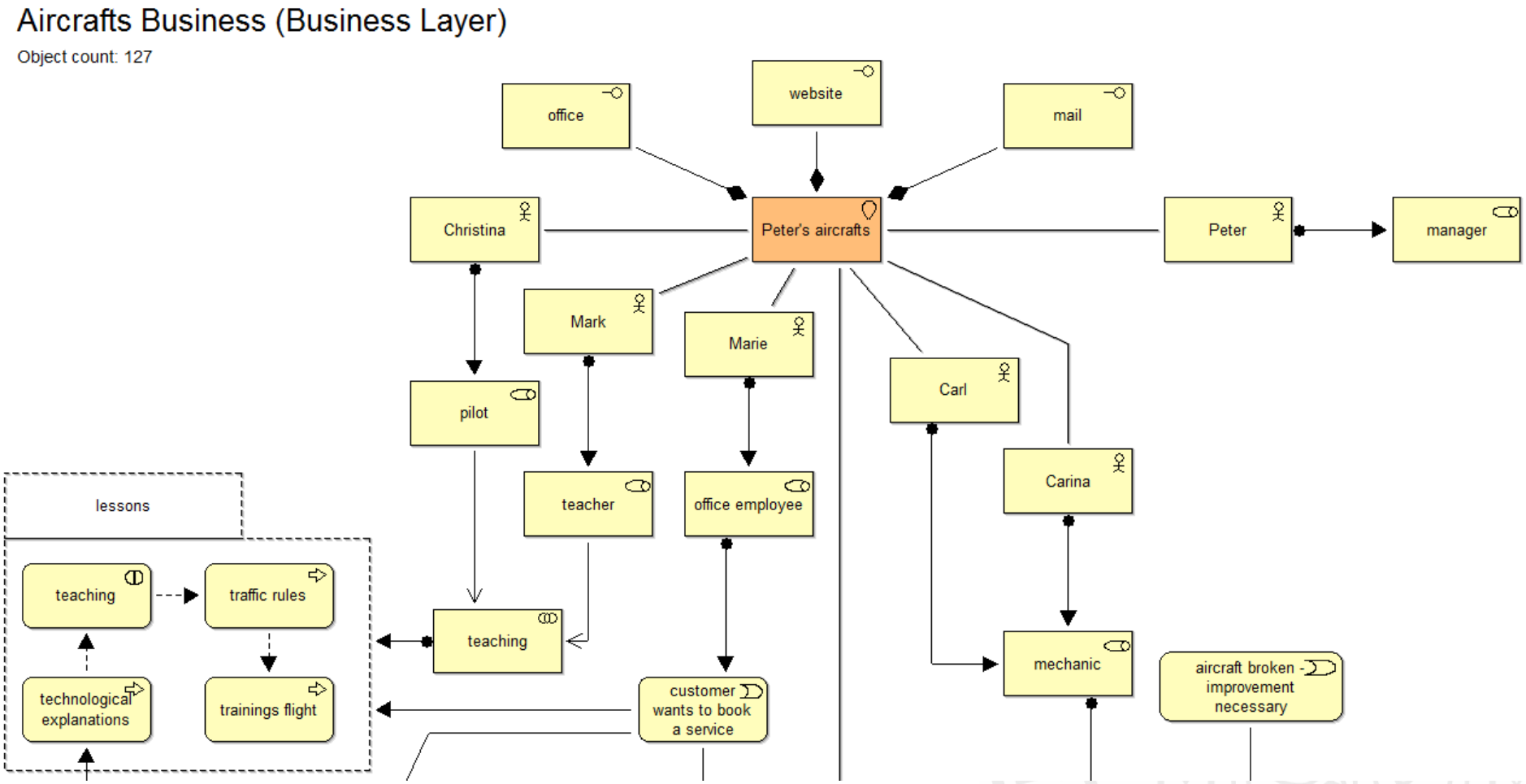
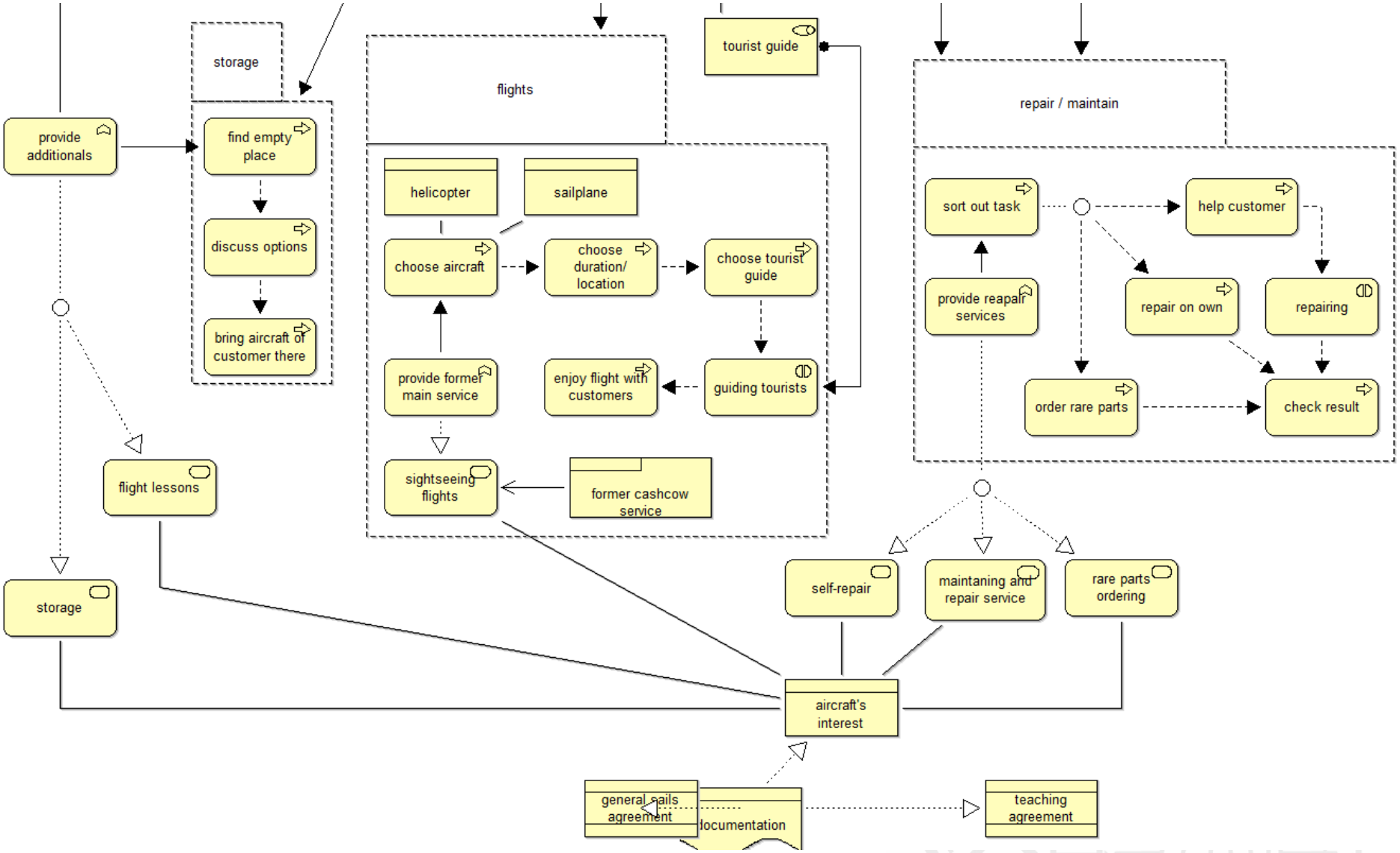
A possible solution [1/2]

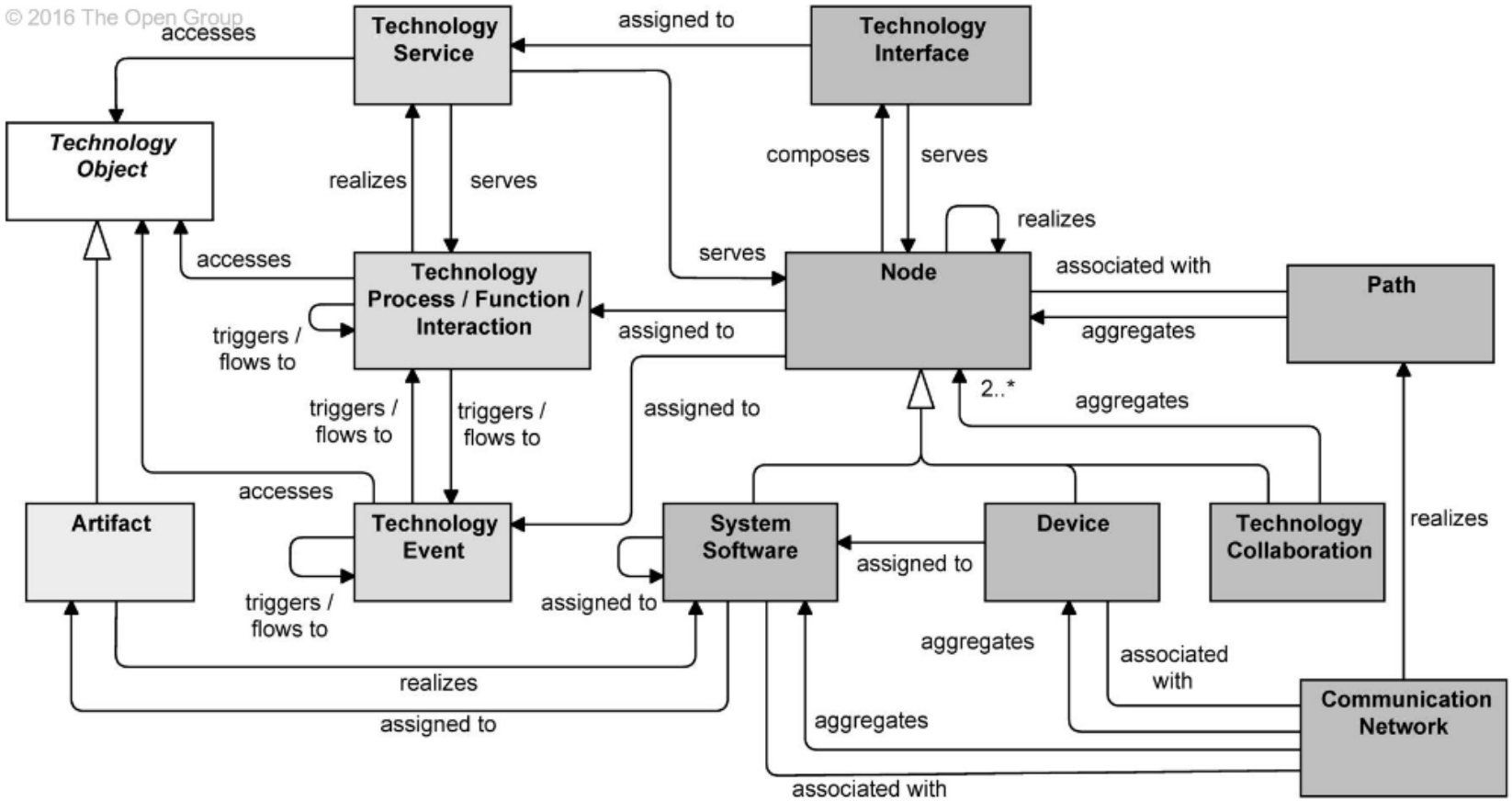


A possible solution [2/2]



3. INTRODUCTION TO ARCHIMATE 3 TECHNOLOGY LAYER MODELING

ArchiMate 3 Technology Layer Metamodel



external

internal

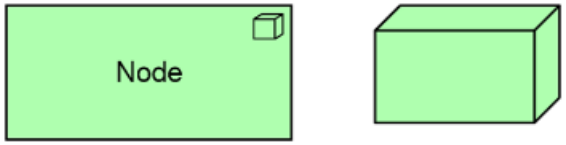
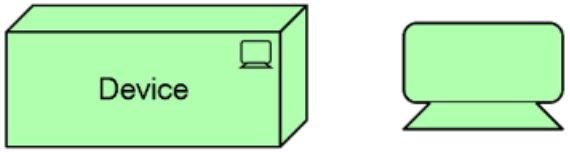
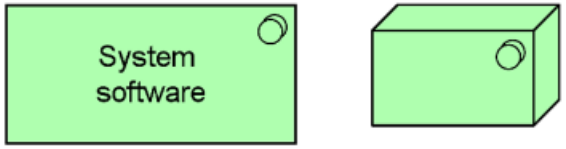
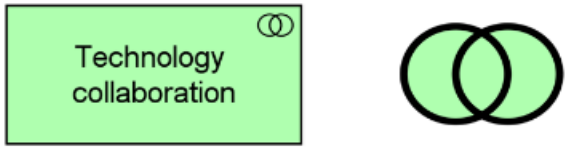
Passive structure

Behavior

Active structure

ArchiMate 3, section 10

ArchiMate 3 Technology Layer Concepts [1/3]

Element	Definition	Notation
Node	A computational or physical resource that hosts, manipulates, or interacts with other computational or physical resources.	
Device	A physical IT resource upon which system software and artifacts may be stored or deployed for execution.	
System software	Software that provides or contributes to an environment for storing, executing, and using software or data deployed within it.	
Technology collaboration	An aggregate of two or more nodes that work together to perform collective technology behavior.	
Technology interface	A point of access where technology services offered by a node can be accessed.	

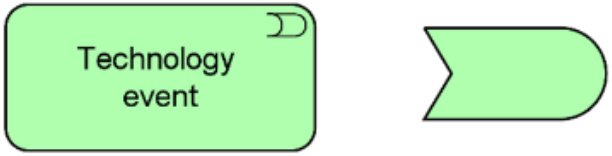
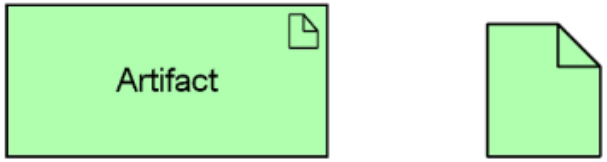
ArchiMate 3, section 10

ArchiMate 3 Technology Layer Concepts [2/3]

Path	A link between two or more nodes, through which these nodes can exchange data or material.	Path
Communication network	A set of structures and behaviors that connects computer systems or other electronic devices for transmission, routing, and reception of data or data-based communications such as voice and video.	Communication Network
Technology function	A collection of technology behavior that can be performed by a node.	Technology function
Technology process	A sequence of technology behaviors that achieves a specific outcome.	Technology process
Technology interaction	A unit of collective technology behavior performed by (a collaboration of) two or more nodes.	Technology interaction

ArchiMate 3, section 10

ArchiMate 3 Technology Layer Concepts [3/3]

Technology event	A technology behavior element that denotes a state change.	
Technology service	An explicitly defined exposed technology behavior.	
Technology object	A passive element that is used or produced by technology behavior.	Abstract element
Artifact	A piece of data that is used or produced in a software development process, or by deployment and operation of a system.	

ArchiMate 3, section 10

Case Study Tasks: Technology Layer

- Create a new Technology Model in the TEAM tool.
- Identify the technology elements:
  - collaboration,
  - function,
  - interaction,
  - event,
  - service,
  - device,
  - path, … and model them.
- Connect the different elements with the correct relations.

Case Study Description: Technology Layer

Mike has identified three business processes for which he would like to propose three technology services as well as the necessary IT infrastructure (devices):

- Use a server-based Billing technology service (in order or manage renting space, machinery and staff as well as issuing the necessary bills). The necessary infrastructure includes 1 server, 2 thin client computers, 1 client-server license for the technology application with 1 server and 3 users. In addition, there is a need for a network- printer.
- Use a workstation in the back office for doing the accounting with a corresponding technology service. The workstation has a network-printer attached to it.
- Billing and accounting exchange data through an interface.
- In the plane service center there are 3 workstations where a diagnosis system is running. They have 1 central printer where clients can print the diagnosis and discuss it with the mechanics. The diagnosis system is used by the mechanics and for the self-service customers.
- All workstations can use a basic set of software: office applications, scheduler, web-browser and e-mail client.
- Use a web-based marketing technology, like a website. The necessary infrastructure and technologies for the website, must be provided.

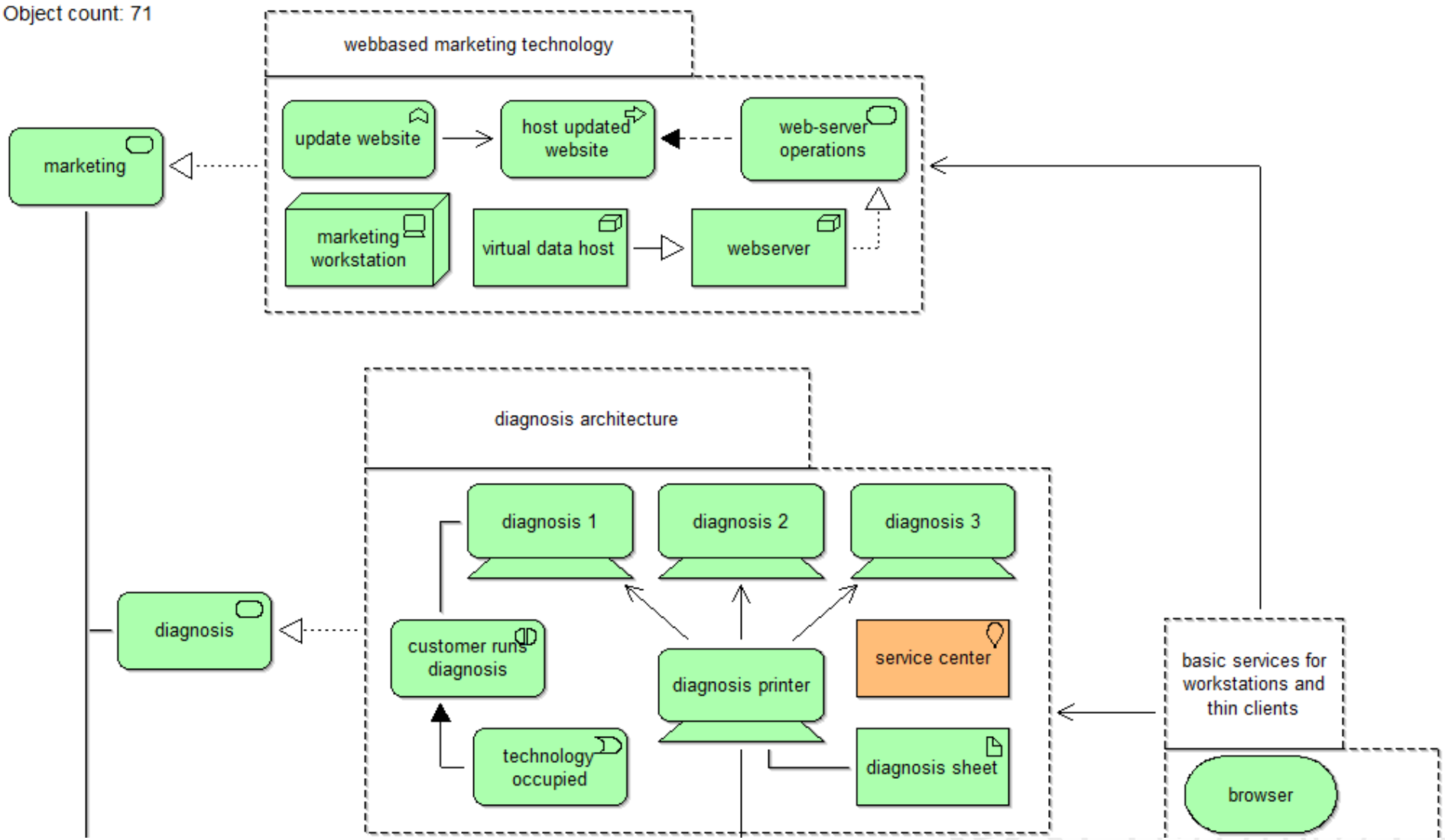
Function | Service | Device

....

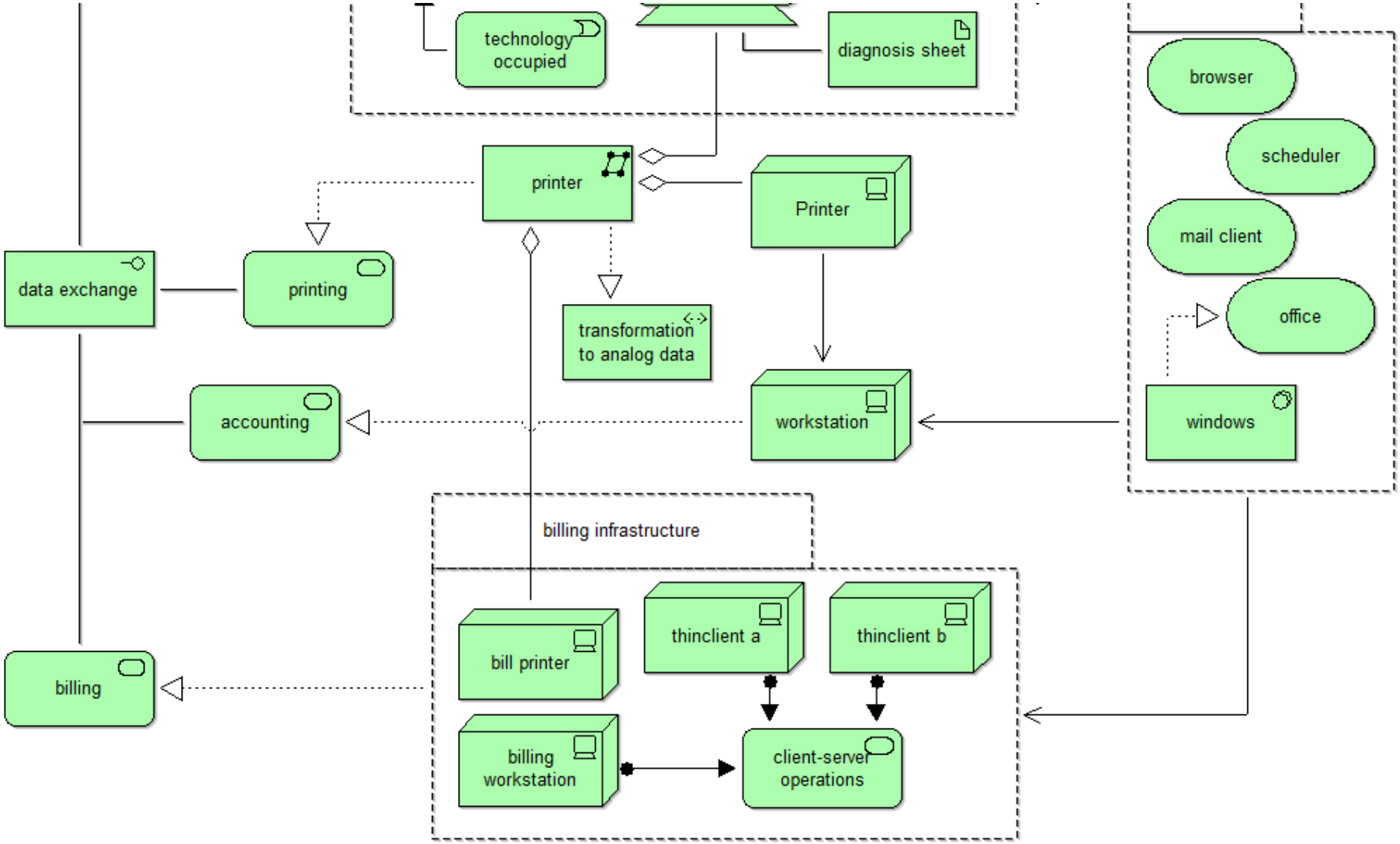
A possible solution [1/2]

Aircrafts Technology (Technology Layer)

Object count: 71

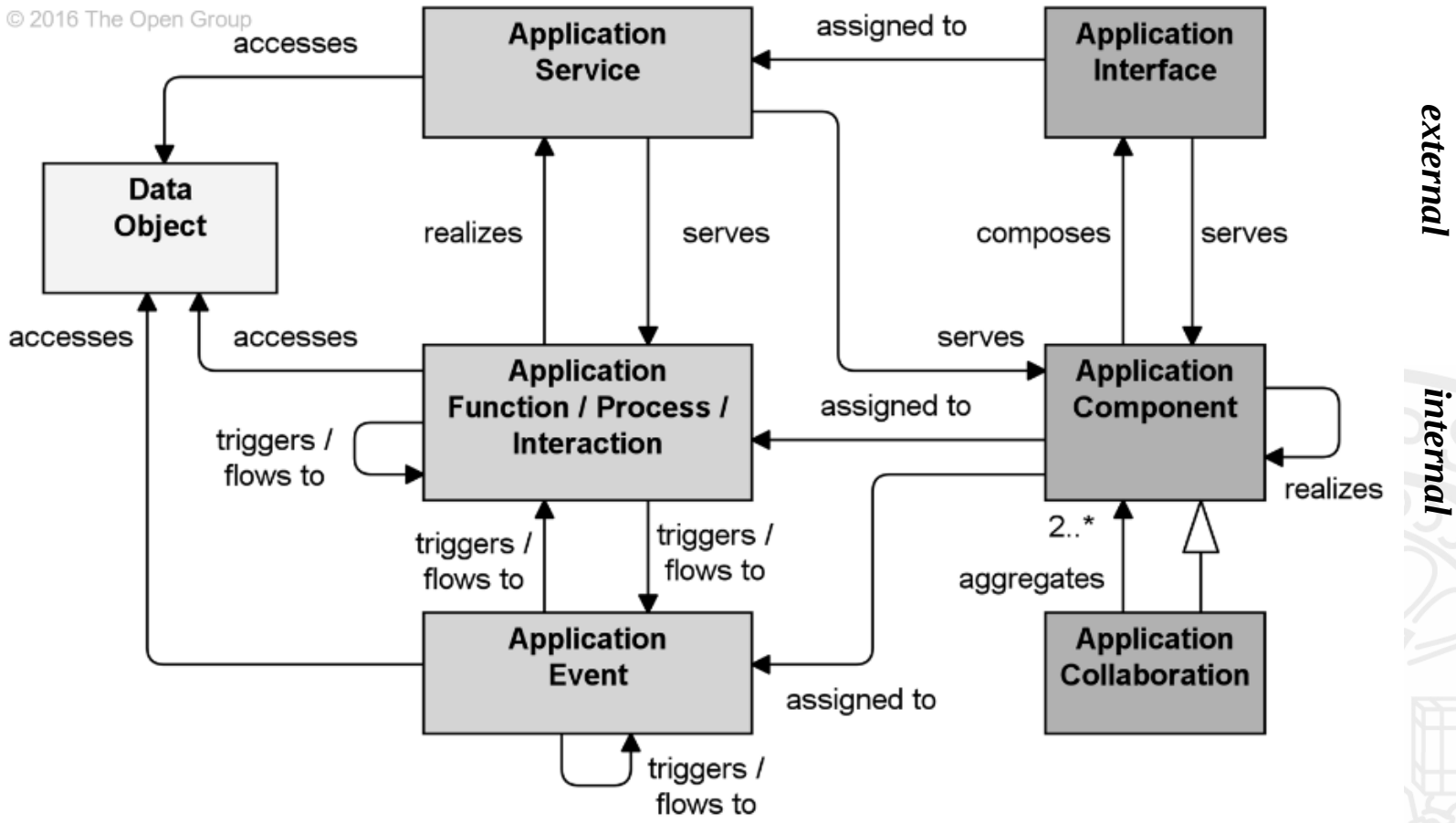


A possible solution [2/2]



4. INTRODUCTION TO ARCHIMATE 3 APPLICATION LAYER MODELING

ArchiMate 3 Application Layer Metamodel



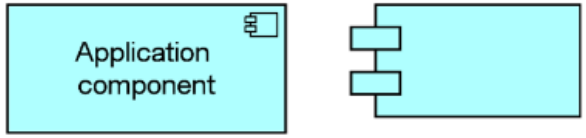
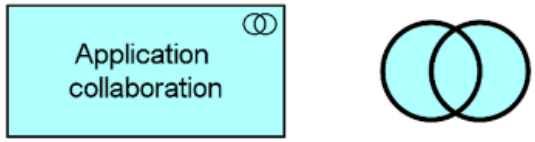
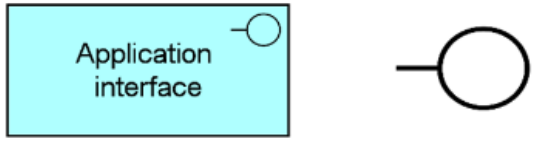
Passive structure

Behavior

Active structure

ArchiMate 3, section 9

ArchiMate 3 Application Layer Concepts [1/2]

Element	Definition	Notation
Application component	An encapsulation of application functionality aligned to implementation structure, which is modular and replaceable. It encapsulates its behavior and data, exposes services, and makes them available through interfaces.	
Application collaboration	An aggregate of two or more application components that work together to perform collective application behavior.	
Application interface	A point of access where application services are made available to a user, another application component, or a node.	
Application function	Automated behavior that can be performed by an application component.	

ArchiMate 3, section 9

ArchiMate 3 Application Layer Concepts [2/2]

Application interaction	A unit of collective application behavior performed by (a collaboration of) two or more application components.	Application interaction
Application process	A sequence of application behaviors that achieves a specific outcome.	Application process
Application event	An application behavior element that denotes a state change.	Application event
Application service	An explicitly defined exposed application behavior.	Application service
Data object	Data structured for automated processing.	Data object

ArchiMate 3, section 9

Case Study Tasks: Application Layer

- Create a new Application Model in the TEAM tool.
- Identify the application elements:
  - collaboration,
  - function,
  - interaction,
  - event,
  - service,
  - data object, … and model them.
- Connect the different elements with the correct relations.

Application Layer

Function | Service | Data object | ....

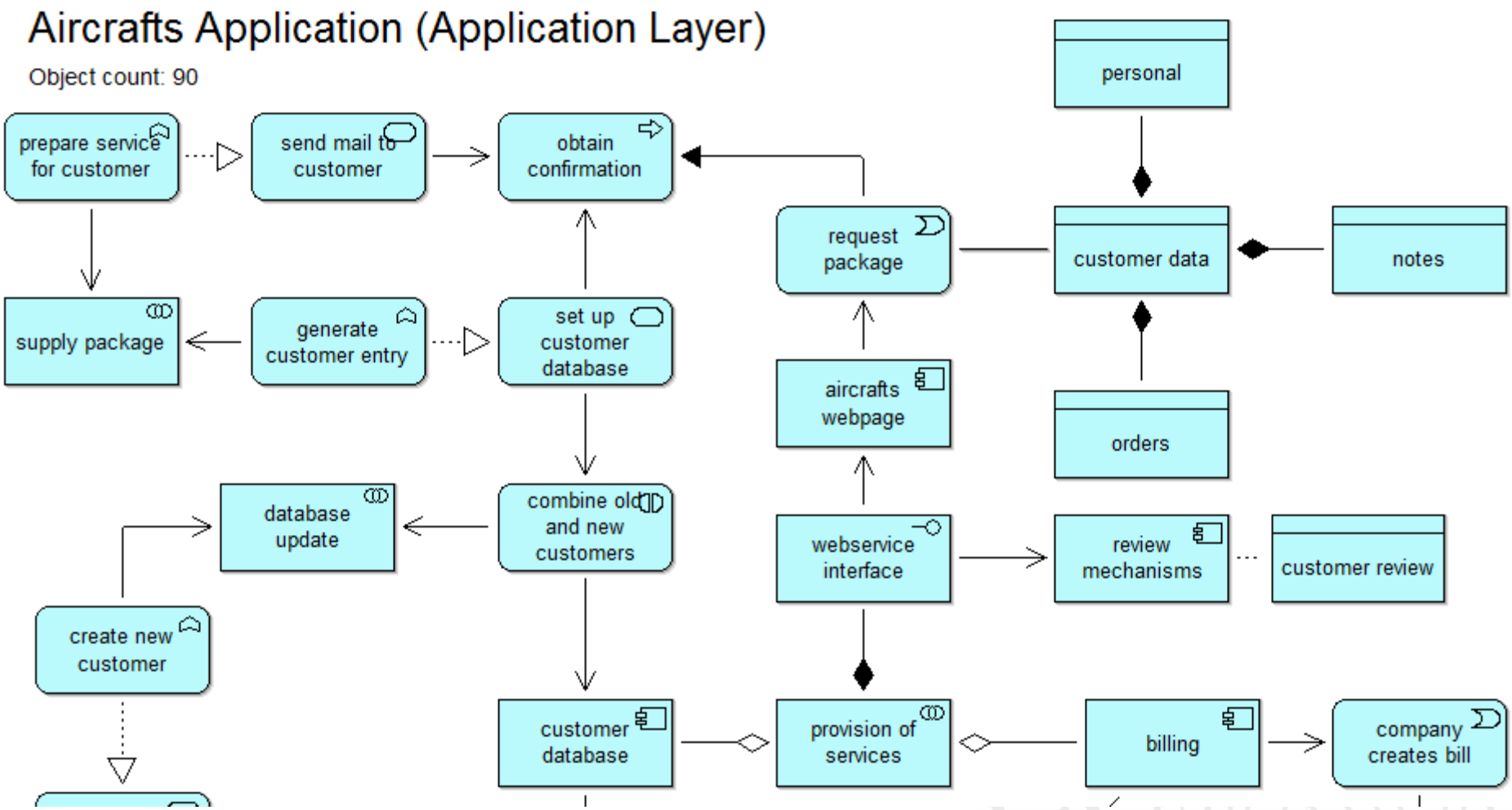
The billing is conducted within the organization by the office staff. There are various ways for financial transactions. In general, bills generated by the organization are sent via email as digitally signed pdf or on postal way with a postmark. Direct debits are used for transactions between the company and suppliers. Customers can either pay directly in the office, which is located at the company area, or after receiving the bill.

The company owns a website, which is mainly for advertising purposes. Peter wants to introduce some extensions and features. The website includes a lot of information. There is information material about the company, the offered packages and the employees. Furthermore, a kind of review system should allow the customers to rate the experienced services.

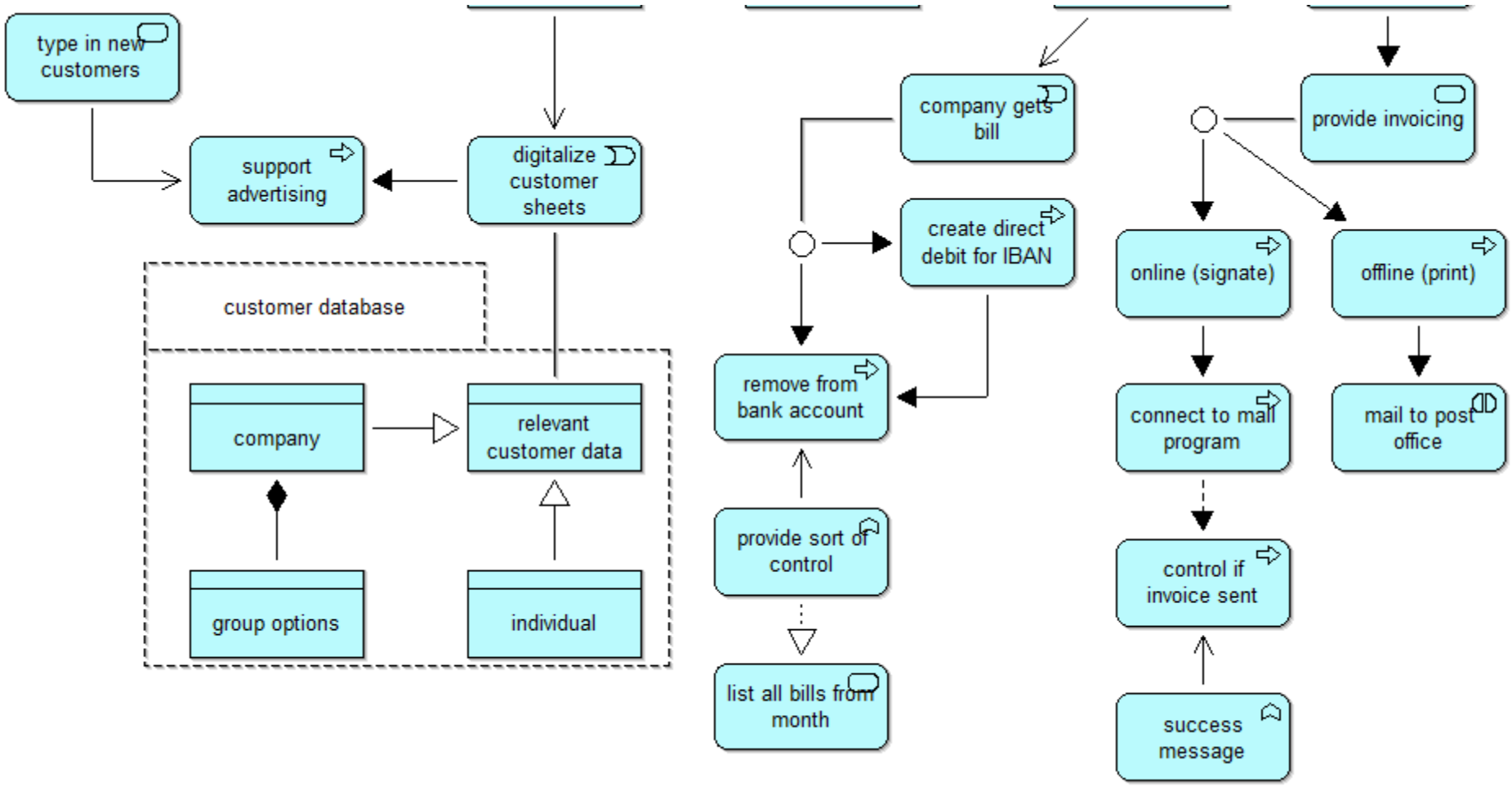
Moreover, there are four ways to book a single service or an offered package. First, the website offers an online booking form. Secondly, a mail can be sent to the company. Thirdly, the customers can call by phone and lastly the customer can visit the office and get advice for choosing the right package directly from the staff.

The customer relationship was very important for Charlie. Therefore, he had a customer file for every steady customer. Peter wants to use this files for advertising and to stay in contact with them regularly. To ease the process of sending adverts per mail or post, the file sheets are digitalized and the data is comprised in a customer database.

A possible solution [1/2]



A possible solution [2/2]



5. ADVANCED MANAGEMENT CAPABILITIES WITH ARCHIMATE

Advanced Management Capabilities with ArchiMate

1. Responsibility Management
2. Business Continuity Management
3. Lifecycle Management

1. Responsibility Management

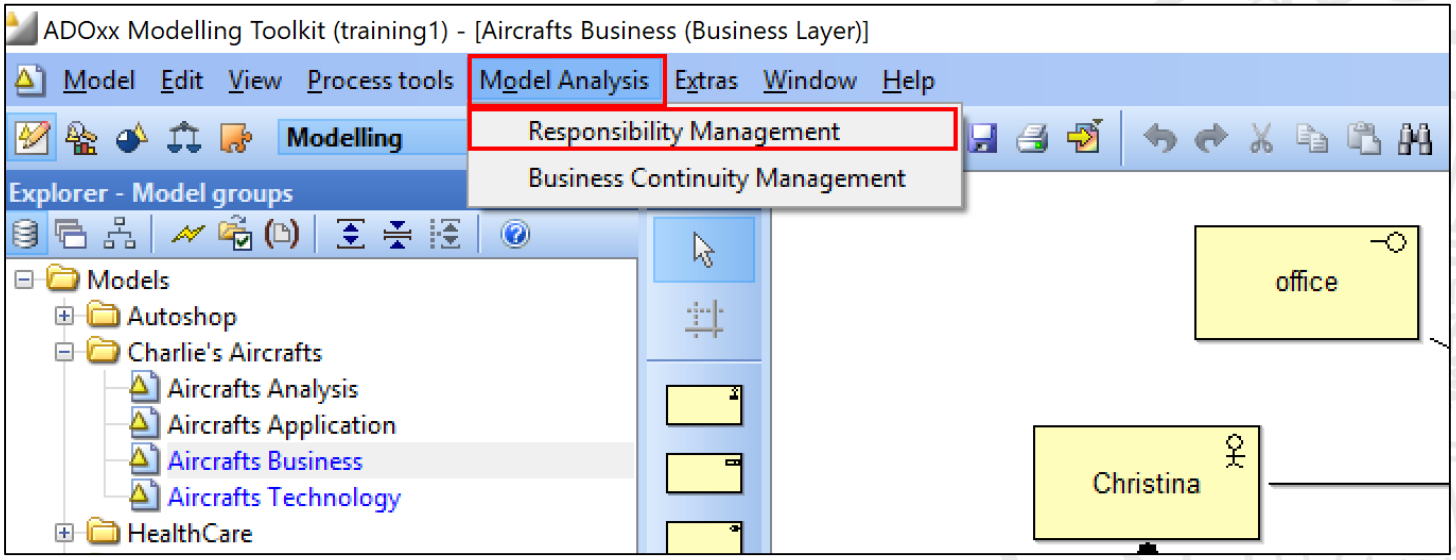
The assignment of responsibilities should enforce a higher level of engagement and ease EA management. This should enable the assignment of technology layer components to actor/role instances from the business layer. To its end, a visualization functionality shall be realized that displays the connections between technology layer instances to the business actor and/or business role instances on the business layer.

The following elements are concerned:

- Node, Device, System software, Technology collaboration, Technology interface, Path, Communication network, Technology function, Technology process, Technology interaction, Technology event, Technology service, Artifact (Technology Layer)
- Business actor, Business role (Business Layer)

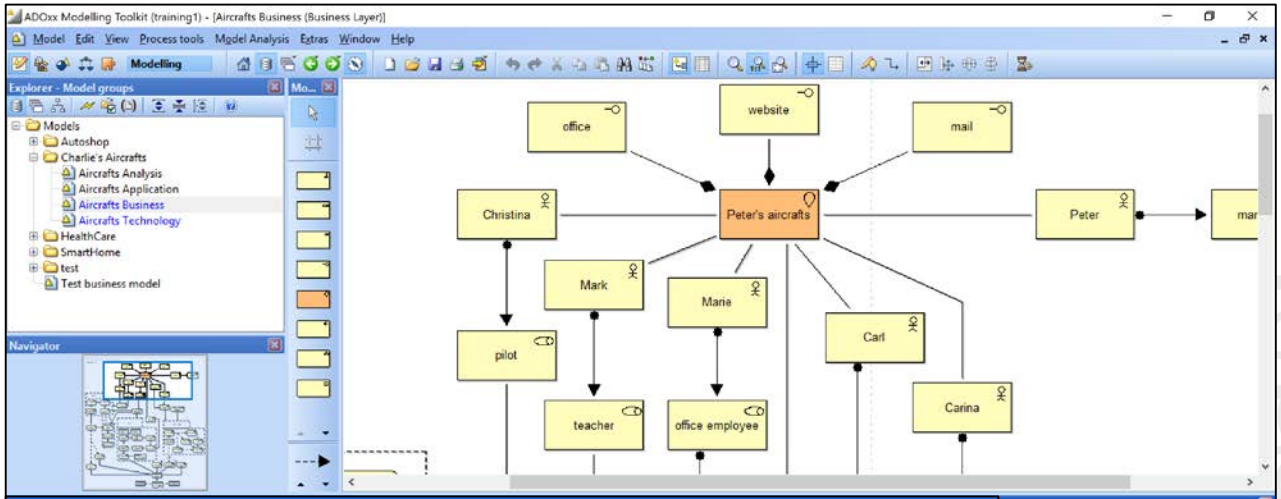
How to conduct responsibility management?

- Open an ArchiMate Business Model in TEAM, double-click on business role or/and business actor, and fill out the “responsible for” attribute
- Choose Model Analysis in the menu
- Select Responsibility Management
- Info message appears, if there is no output



Tasks and sample output

- Define the necessary attributes (interrefs).
- Conduct one Responsibility Management Analysis.



Responsibility View: Business Layer to Technology Layer

Business Role or Actor	Technology Object	Technology Object Type
mechanic	customer runs diagnosis	Technology interaction
mechanic	diagnosis	Technology service
mechanic	technology occupied	Technology event
office employee	accounting	Technology service
office employee	billing	Technology service
office employee	marketing	Technology service
office employee	office	Technology service
office employee	host updated website	Technology process
office employee	update website	Technology function
manager	windows	System software
manager	update website	Technology function
Marie	printer	Communication network
Carl	diagnosis 2	Device

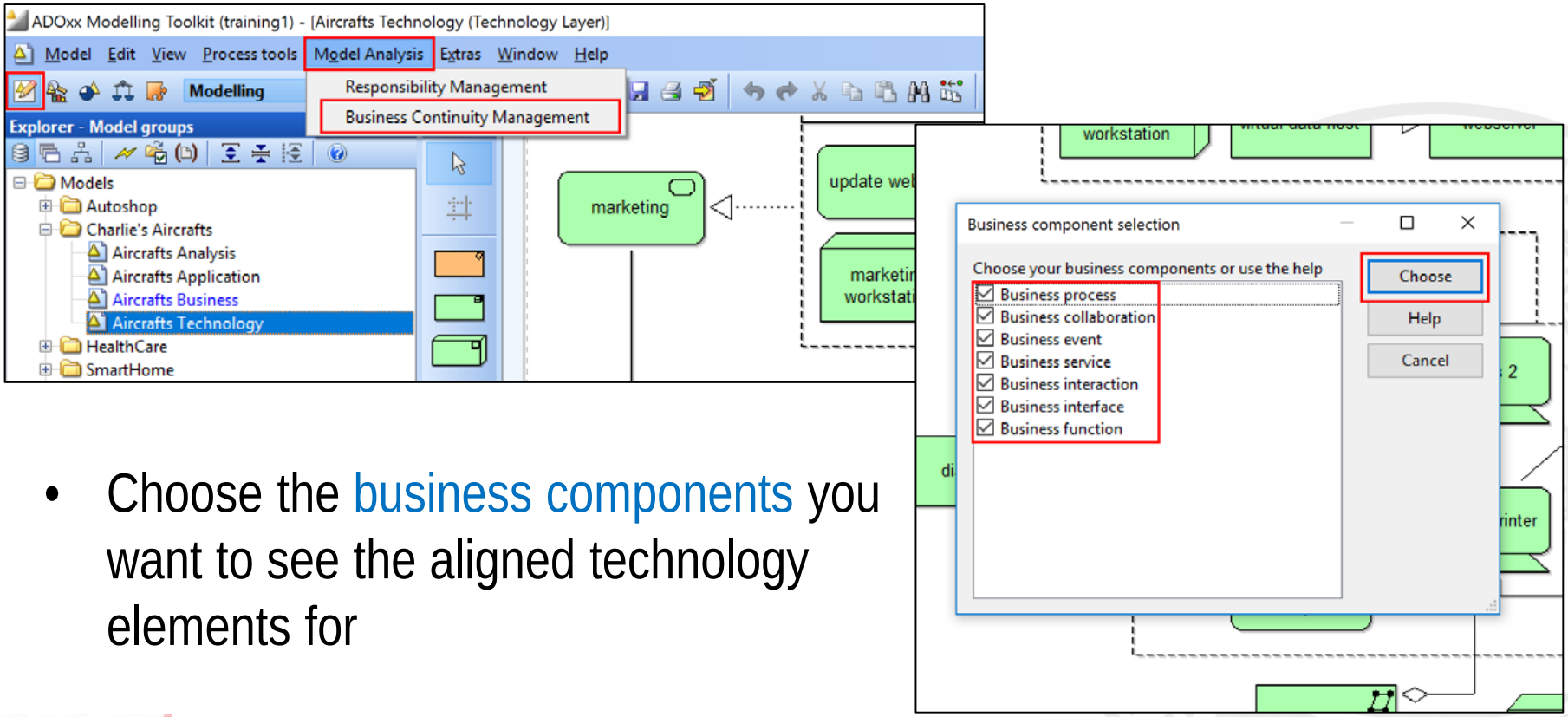
2. Business Continuity Management

The impact of several components on others plays an important role for maintaining a running system. Therefore, a connection between business and technology models should be established.

The goal is to determine the impact of a technology element (function, process, interface, collaboration, interaction, event, service) on a business layer element of the same type.

How to conduct business continuity management in TEAM

- Open a Technology Model and fill out the attribute “influence on”
- Choose Model Analysis in the menu
- Select Business Continuity Management

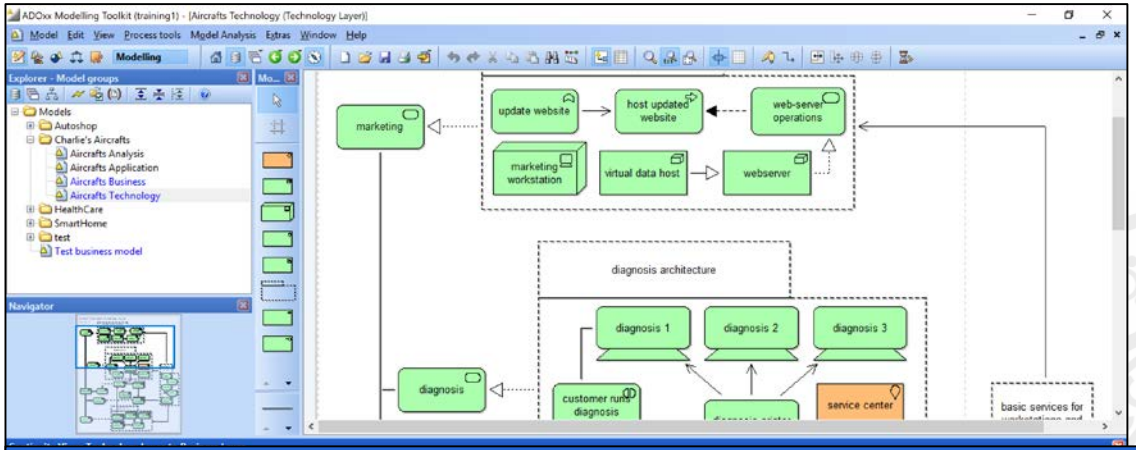


- Choose the business components you want to see the aligned technology elements for

Tasks and sample output

Define the necessary attributes (interrefs).

Conduct one Business Continuity Management Analysis with business service and business element.



Continuity View: Technology Layer to Business Layer

Technology Object	Technology Object Type	Business Object	Business Object Type
host updated website	Technology process	customer wants to book a service	Business event
customer runs diagnosis	Technology interaction	customer wants to book a service	Business event
technology occupied	Technology event	aircraft broken - improvement necessary	Business event
marketing	Technology service	customer wants to book a service	Business event
customer runs diagnosis	Technology interaction	self-repair	Business service
billing	Technology service	rare parts ordering	Business service
billing	Technology service	storage	Business service
diagnosis	Technology service	maintaning and repair service	Business service
diagnosis	Technology service	self-repair	Business service
marketing	Technology service	sightseeing flights	Business service
printing	Technology service	self-repair	Business service

3. Lifecycle Management

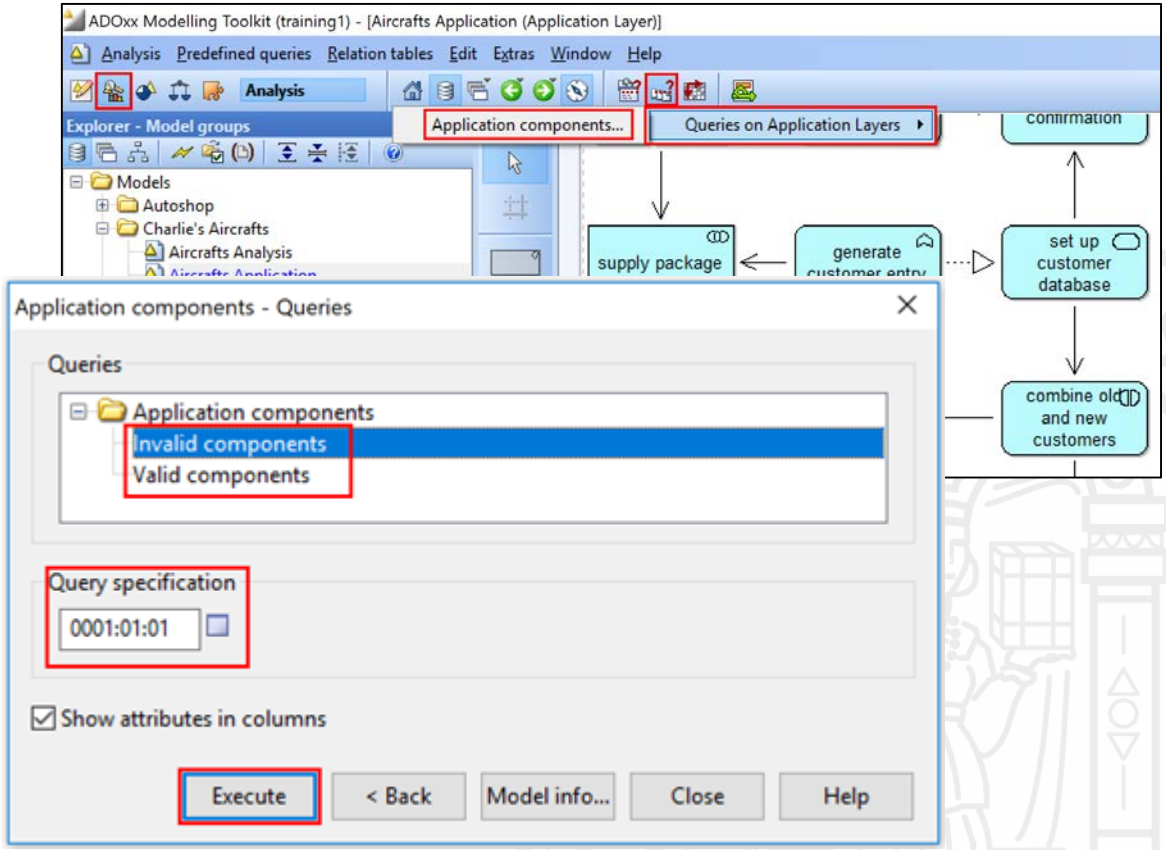
When dealing with ICT, lifecycle management plays a vital role. Questions like ”until when are software systems with updates supported”, or ”when becomes a certain component invalid?” are central for EA management.

There should be different kinds of dates in the various layers. For example, the application layer components could have attributes for licenses, which can be outdated or invalid. Time elements in the model offer possibilities regarding queries and a kind of lifecycle management in the model.

Therefore, the attribute “Valid until” is included for application component, application collaboration, application interface, application function, application interaction, application process and application service.

How to conduct pre-defined queries? (1)

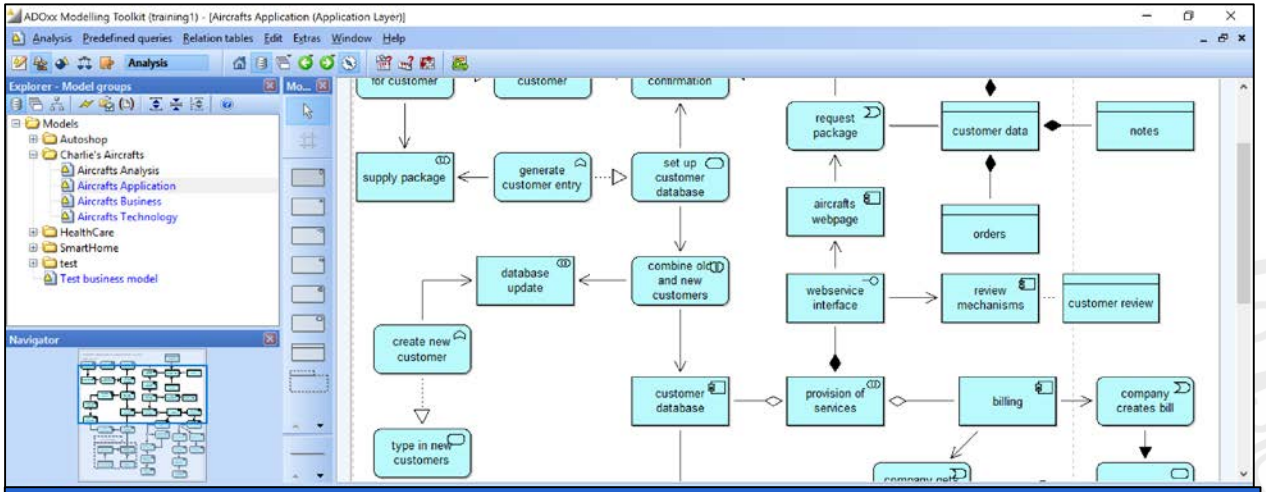
- Open an application model and fill out the attribute “valid until”
- Choose the model analysis component in the menu
- Choose pre-defined queries -> queries on application layers -> application components
- Select an application model in the following dialog
- Select if invalid or valid components should be shown
- Choose a date in the query specification, which is used as a basis for the validation, the small blue window symbol provides a more convenient method of selecting a date
- Execute the query



Tasks and sample output

Fill out dates for the application elements.

Conduct a Predefined Query with invalid elements and the 14th of March 2018



Query results - Invalid components

	Valid until
1. Aircrafts Application	
aircrafts webpage	2018:03:01
prepare service for customer	2018:03:02
success message	0001:01:01
combine old and new customers	1400:05:28
mail to post office	0001:01:01
webservice interface	1900:01:01
online (signate)	2017:01:01

DISCUSSION & EVALUATION

Discussion

Structuring questions (put yourself into the position of being an Enterprise Architect):

1. Which questions bother you as an EA?
2. Which information is required to answer these questions?
3. Which elements of ArchiMate could comprehend this information?
4. How should an EA management tool support you?

Feedback

- We would be very thankful if you could give us some feedback on the tool!

https://eam-ttf-final.questionpro.com

Dr. Dominik Bork dominik.bork@univie.ac.at

THANK YOU FOR YOUR ATTENTION!

References & Further Reading

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