

Architekturen und Modelle

– Möglichkeiten und Herausforderungen –

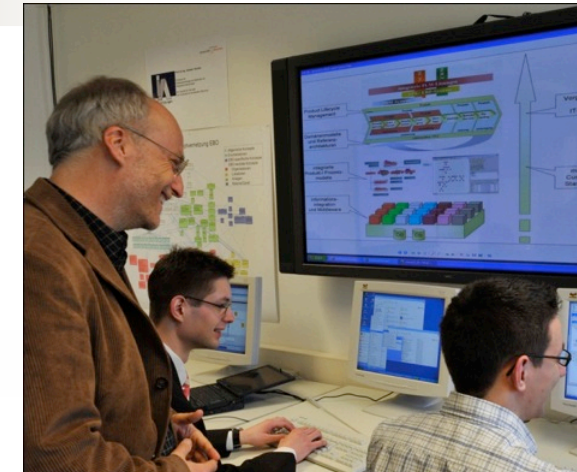
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Workshop „Perspektiven der Modellbildung & Simulation“
Februar 2018

Professur für Softwarewerkzeuge und Methoden für integrierte Anwendungen

Modell- und architekturbasierte Gestaltung integrierter Anwendungssysteme



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**Product Lifecycle
Management (PLM)
Industrie 4.0**



**C4ISR/ Network
Enabled Capability**



**e-Mobility
IoT**

Domain



**Domain Models &
Reference Architectures**



**Integrated Product/
Process Models**



**Enterprise (Security) Architecture
& IT Service Management**

Model/Architecture



**Middleware &
Information Integration**



**Mobile, Web &
Cloud Technologies**



**Knowledge-based
Decision Support &
Semantic Integration**

IT/Technology

www.unibw.de/iA



Bild: Viktor Enrich (<http://victorenrich.com>)



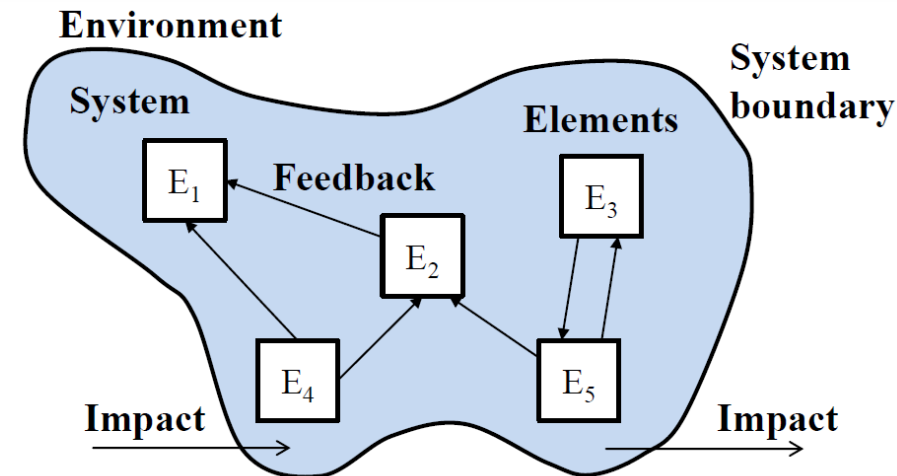
Ein „System“ – viele Perspektiven



(System-)Architektur

A system is a set of **elements** and their **interrelations** which are delimited by their **environment**. Such elements can be tangible or intangible components forming the system by their interactions which address a common goal. A system is considered to be open if interaction with the environment can occur.

Quelle: [Schneider_2016]



Die **Architektur** eines Systems umfasst die Grundkonzepte und Eigenschaften eines Systems in seiner Umwelt, verkörpert durch dessen Elemente, Relationen und durch die Prinzipien seines Entwurfs und seiner Evolution.

[angelehnt an: ISO/IEC/IEEE 42010]

Enterprise Architecture EA

Die Architektur eines **Systems** umfasst die Grundkonzepte und Eigenschaften eines Systems in seiner Umwelt, verkörpert durch dessen Elemente, Relationen und durch die Prinzipien seines Entwurfs und seiner Evolution.

System = Unternehmen/ Organisation/ Institution

Eine **Unternehmensarchitektur** (engl. Enterprise Architecture, EA; Plural: EAs) umfasst als kohärentes Ganzes die wesentlichen Konzepte eines in seine Umwelt eingebetteten Unternehmens, verkörpert durch seine Elemente und deren Beziehungen untereinander und zur Umwelt sowie die Methoden, Modelle und Prinzipien, die beim Entwurf und bei der gesteuerten Evolution des Unternehmens genutzt werden.

EA – to architect the enterprise



definitions ▼ architect

In fact, just what an Enterprise Architect is actually supposed to do is curiously still up for debate, more than 25 years after EA's invention. Common to most definitions is the notion that such architects must drive business transformation in their organizations. "Digital transformation is a fantastic way to rethink Enterprise Architecture," reports Angelo Andreetto, who is Senior Enterprise Architect for Zurich Insurance Group in Zurich, Switzerland and a TOGAF® 8 and Zachman Certified™ Enterprise Architect and a Certified ScrumMaster®. "Enterprise Architects should be architecting the enterprise."

What, then, does it mean to architect an enterprise? Ken Griesi, a leading practitioner and thought leader in the EA field, echoes Andreetto's perspective. "Unfortunately, EA is often synonymous with the practice of documenting one person's viewpoint of their company's IT," Griesi bemoans. "In reality, EA is about the skillful manipulation of an enterprise's structure and behavior within a complex environment."

Quelle: <https://www.forbes.com/sites/jasonbloomberg/2014/07/11/is-enterprise-architecture-completely-broken/#3deeb70f3710>

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WS "Perspektiven der Modellbildung & Simulation" 2018

architect

Quelle: <http://www.dictionary.com/browse/architect>
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[ahr-ki-tekt]

Spell

Syllables

Examples

Word Origin

See more synonyms on [Thesaurus.com](http://www.thesaurus.com)

noun

1. a person who engages in the profession of architecture.
2. a person professionally engaged in the design of certain large constructions other than buildings and the like:
landscape architect; naval architect.
3. the deviser, maker, or creator of anything:
the architects of the Constitution of the United States.

verb (used with object)

4. to plan, organize, or structure as an architect:
The house is well architected.

EA – Ebenen, Stakeholder, Artefakte

- strategische Ausrichtung
- Geschäftsmodell
- Geschäftsprozesse
- Stakeholder
- Produkte/ Services/ Fähigkeiten



Business Architecture



(*)



- fachkonzeptionelle Modelle
- Datenmodelle
- Funktionen, IT-Services
- Informationsflüsse

Information Architecture

Application Architecture

- Anwendungssysteme
- Standard-Software
- Application Integration
- Middleware Paradigmen (z.B. SOA)



Technology Architecture

- Plattformen, Betriebssysteme
- SW-Architekturen, Middleware
- Technologische Basis (HW/SW)
- Server, Netzwerke, Kommunikation



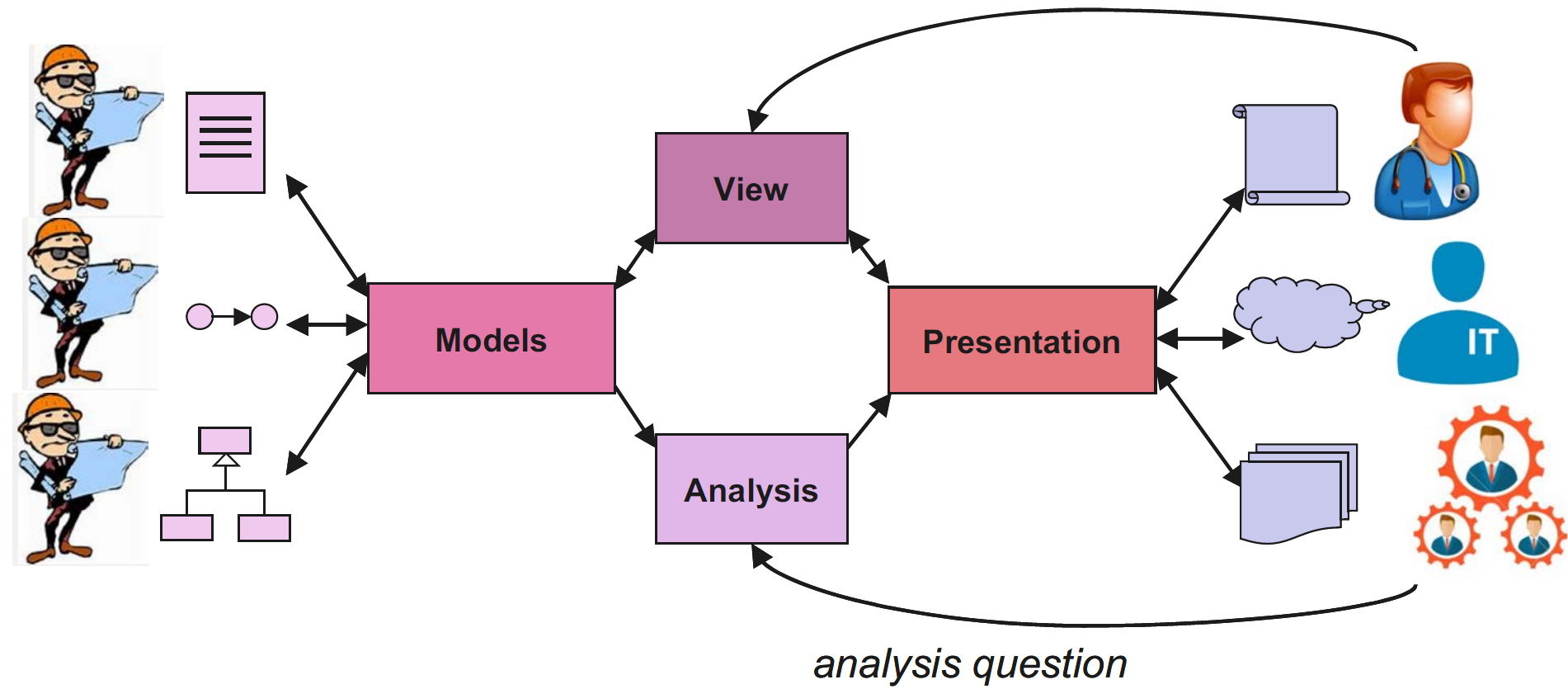
“The most important characteristic of an enterprise architecture is that it provides a **holistic** view of the enterprise.”

(*) icons: www.large-icons.com/free-icons/boos.htm www.aha-soft.com

EA – Modelle, Sichten, Analyse

Enterprise Architects

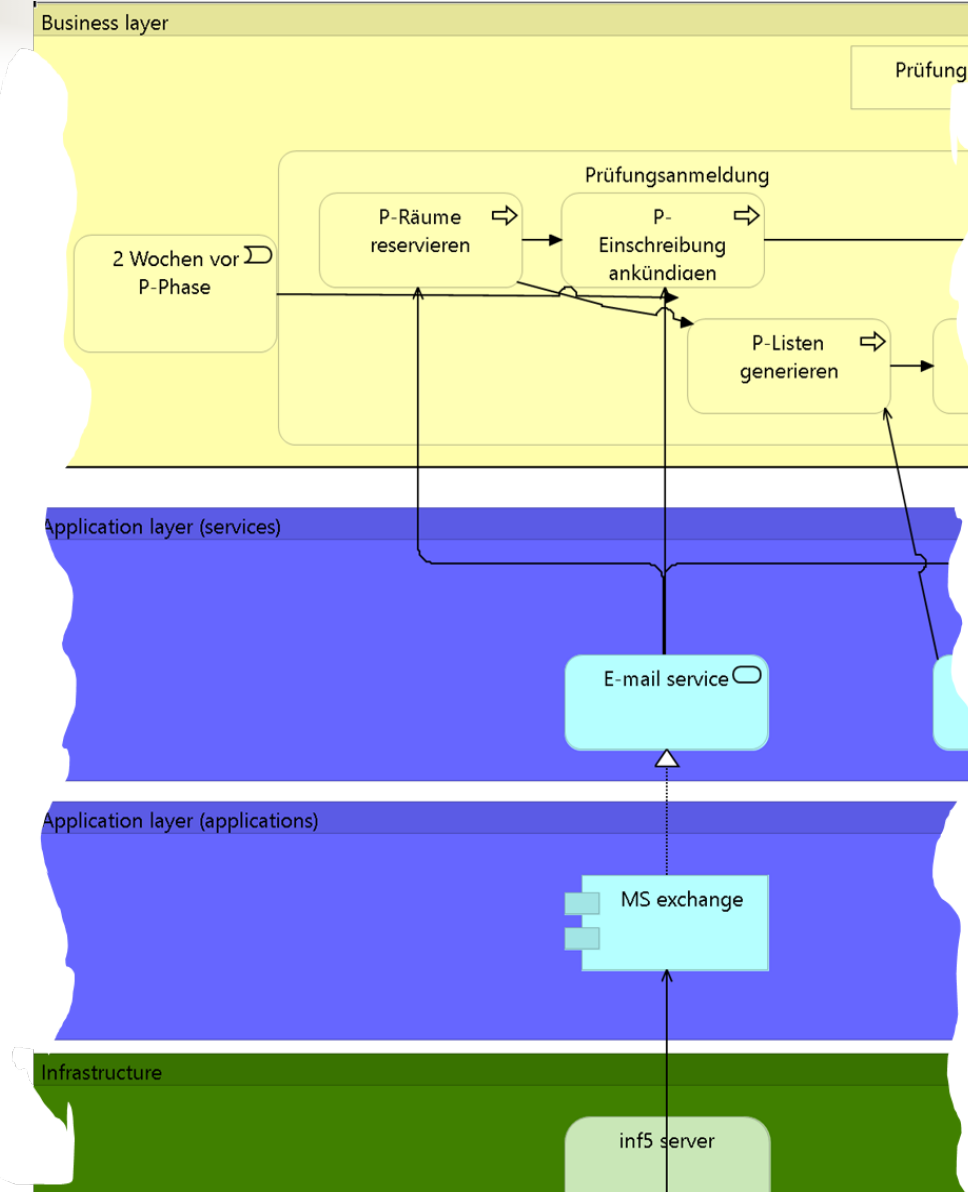
Stakeholders



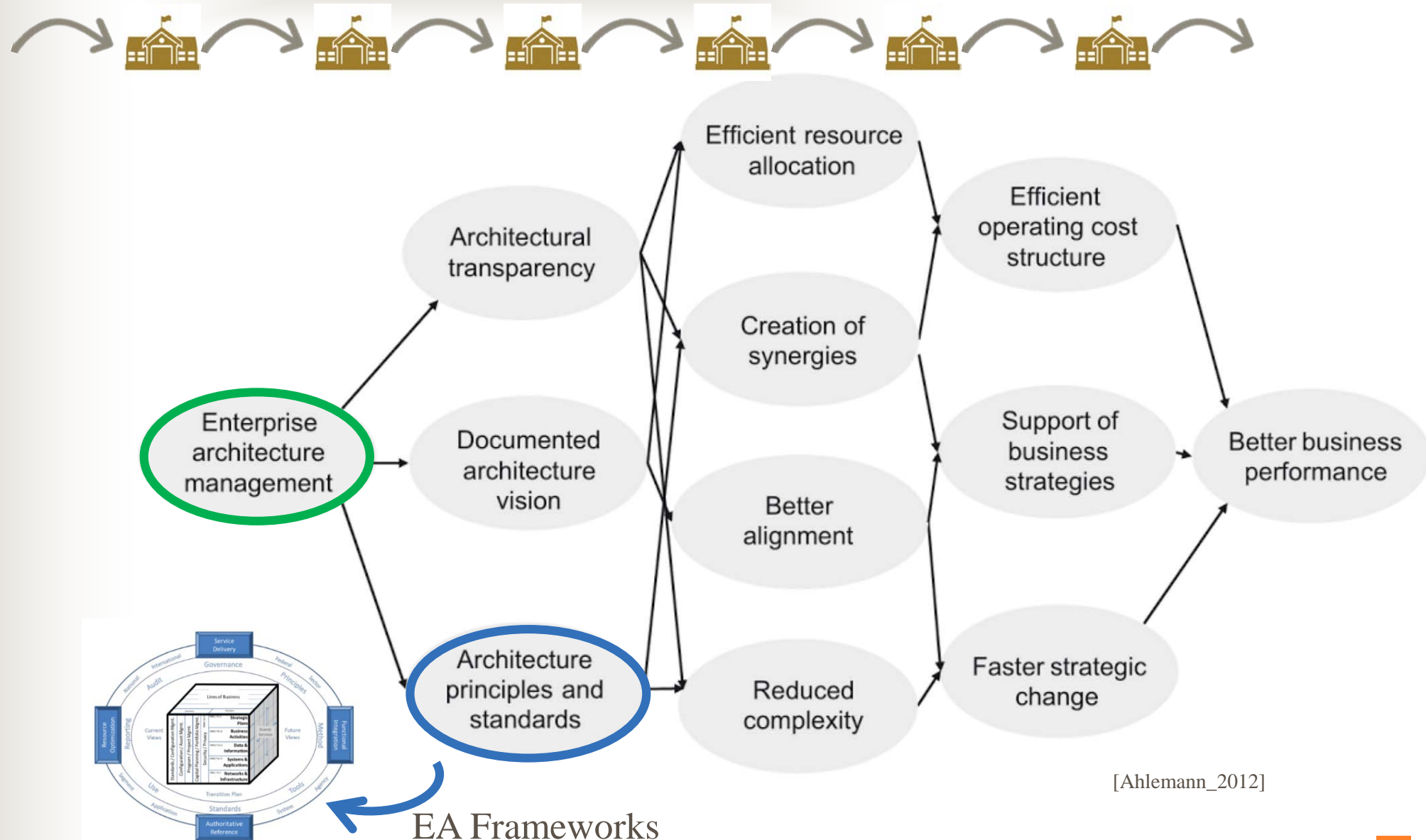
angelehnt an: [Lankhorst_2017]

Enterprise Architecture Management EAM

- Komplexe Unternehmen entwickeln sich ständig weiter
- Damit sind auch die EA-Modelle und -Beschreibungen einem ständigen Wandel unterzogen
 - Beispiel: Ausschnitt einer durchgängig modellbasierten Architekturbeschreibung einer Universität
[aus: Karcher_Mihelcic_2017]
- Eine Organisation, die von EA profitieren will, muss eine entsprechende Management-Ebene etablieren



Enterprise Architecture Management EAM



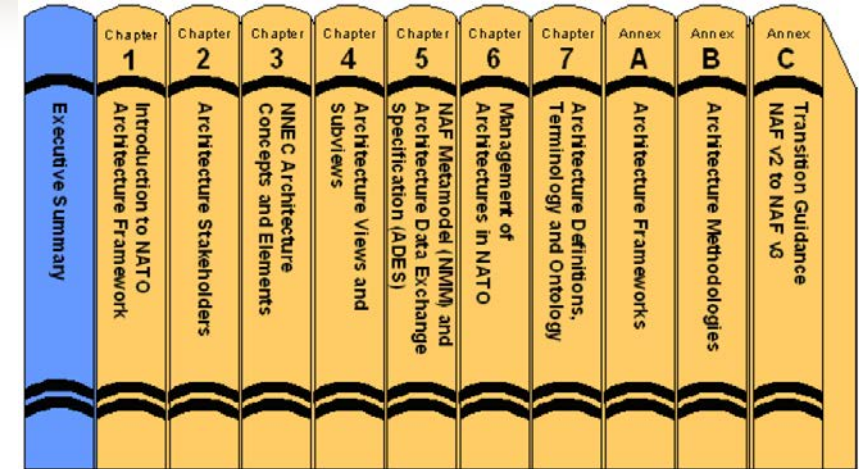
EA Frameworks



NATO Architecture Framework

Version 3

1.3 Purpose and Scope of the NAF



While fulfilling the general requirements to an Architecture Framework, NATO Architecture Framework is also adapted to NATO processes. NAF provides a set of tools that enables NATO to manage and bring forward strongly needed capabilities and support the implementation of NNEC.

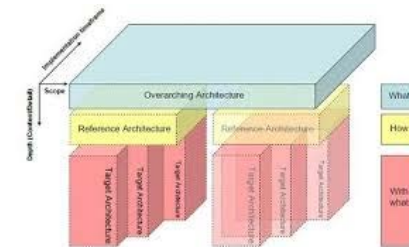
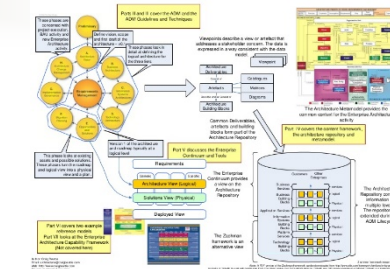
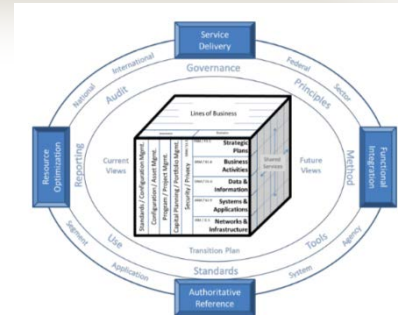
NAF is capable to support a complete expression of the NATO enterprise, as in NATO Overarching Architecture (OA), and provide mechanisms that enable communication about the essential elements of the NATO enterprise and its environment, including partners.

NAF supports capturing the vision of NATO in all its dimensions and complexity. The NAF architectures developed will be an important contribution to ensure that the members of the alliance, and also Partner Nations, are focussing on the same goals. Development of operational capabilities and the transformational process to reach the objectives of NATO Network Enabled Capabilities (NNEC) are examples of what NAF architectures will support.

[NATO 2007]]

EA Frameworks

Prof. Karcher



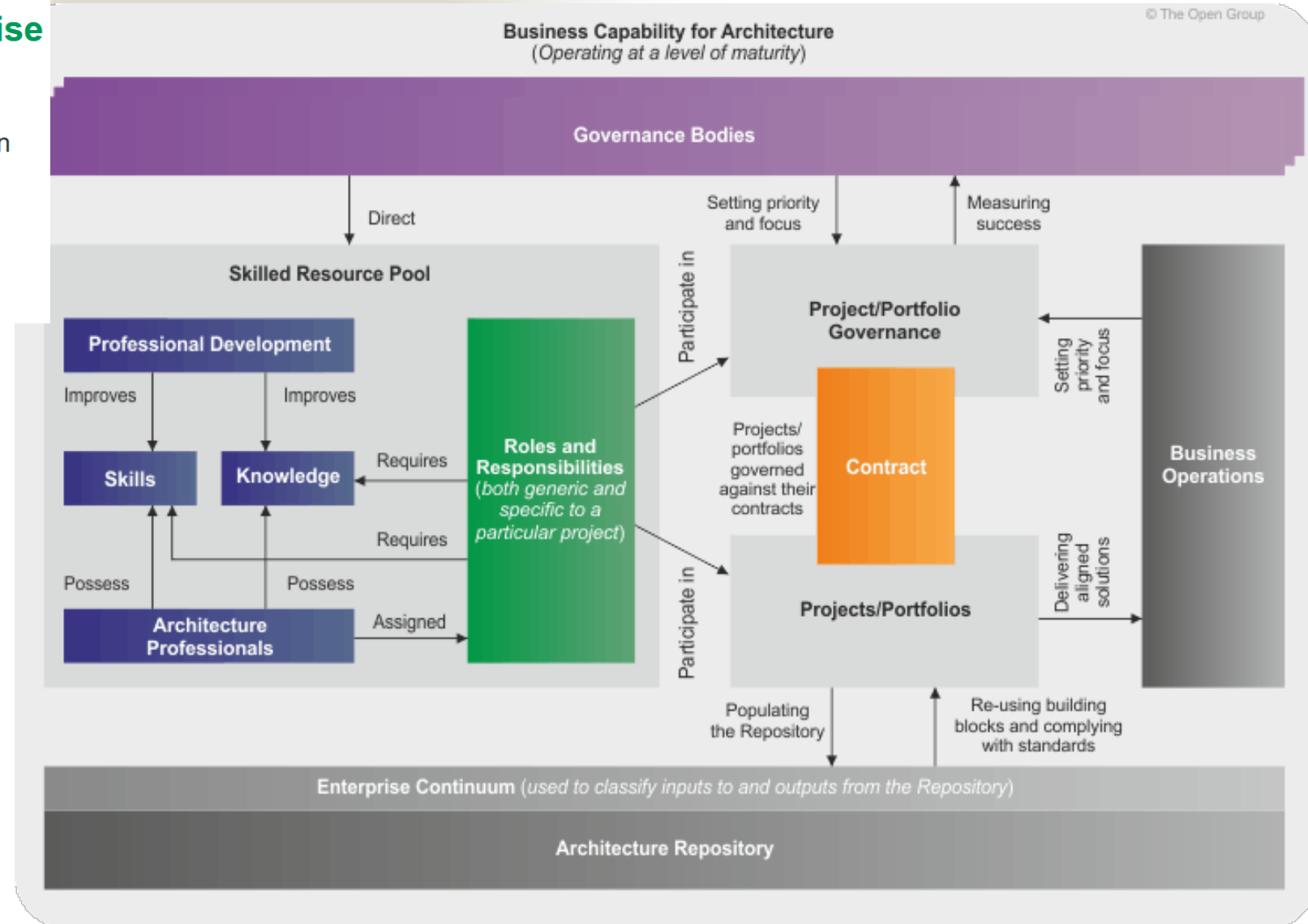
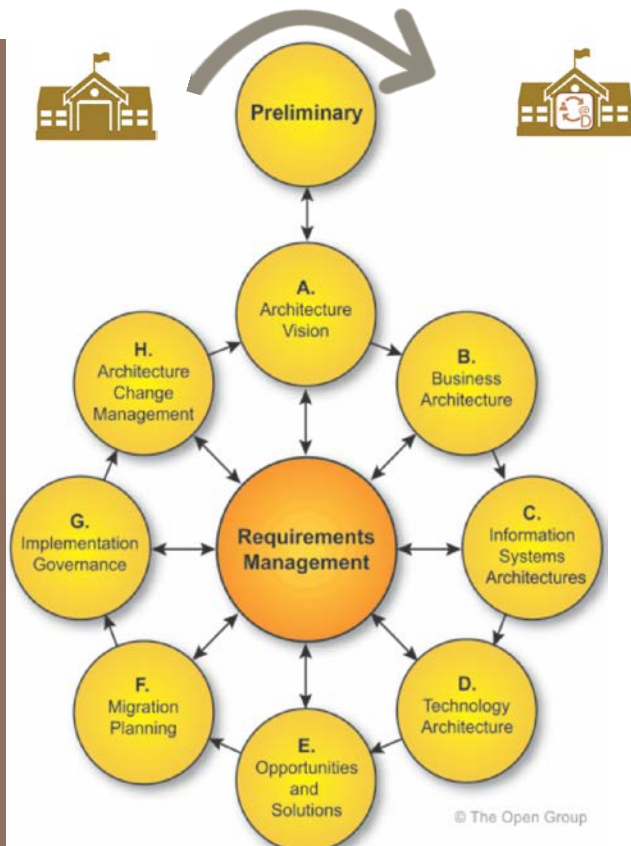
Frameworks seek to break down the enterprise into its component parts, following the theory that you must understand the parts to improve the whole. And yet, according to Griesi, “EA fails when enterprises are treated as discrete systems that can be reduced into smaller problem sets, as traditional engineering approaches or some EA frameworks would have us believe.” The problem here is that the enterprise isn’t an ordinary system like a machine or a building, and can’t be architected or engineered as such. Instead, “businesses are living organisms,” according to Griesi. “EA succeeds when enterprises are treated as complex systems that are constantly changing and adapting.”

Quelle: <https://www.forbes.com/sites/jasonbloomberg/2014/07/11/is-enterprise-architecture-completely-broken/#3deeb70f3710>
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EA Frameworks – EAM in TOGAF (Ausschnitt)

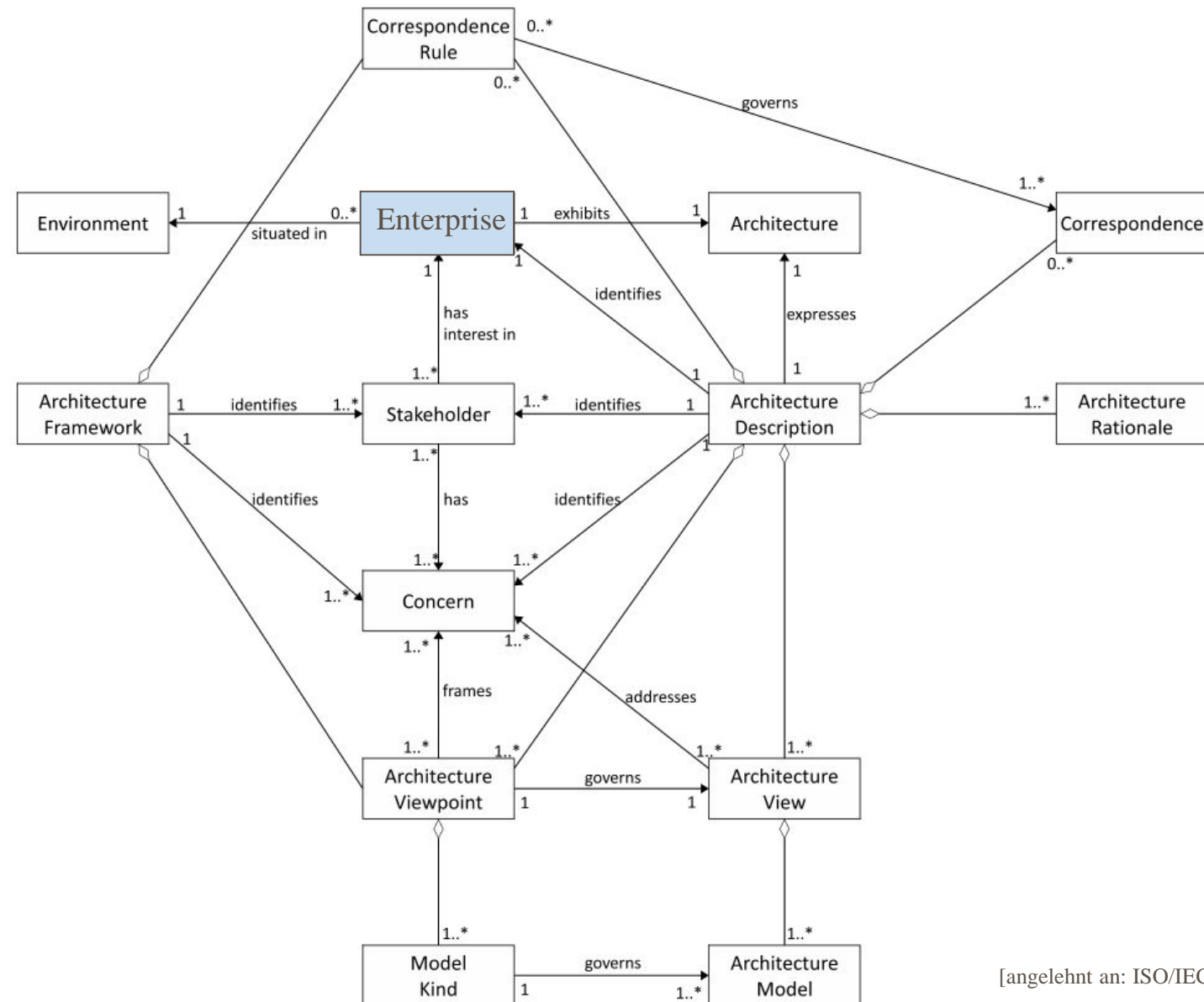
2.8 Establishing and Maintaining an Enterprise Architecture Capability

In order to carry out architectural activity effectively within an enterprise, it is necessary to put in place an appropriate business capability for architecture, through organization structures, roles, responsibilities, skills, and processes. An overview of the TOGAF Architecture Capability is shown in Figure 2-5.



TOGAF

Quelle: The Open Group <http://pubs.opengroup.org/architecture/togaf9-doc/arch/index.html>
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[angelehnt an: ISO/IEC/IEEE 42010]

EA-Modelle



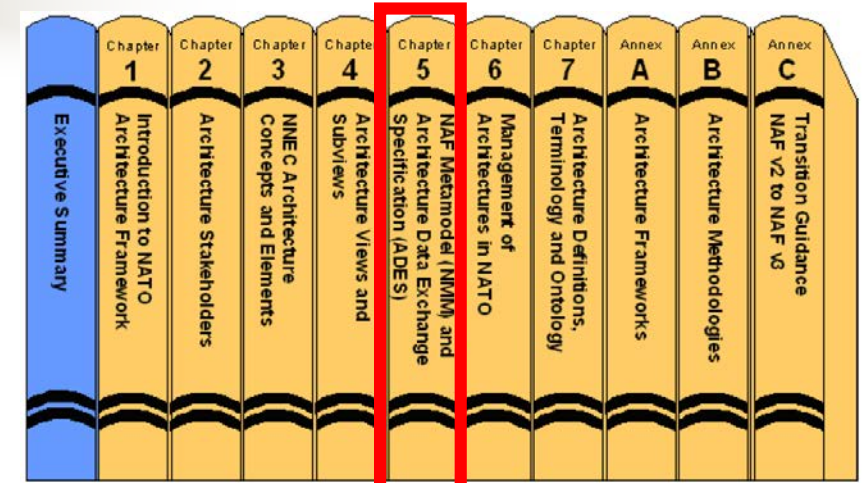
NATO Architecture Framework Version 3

CHAPTER 5 NATO Architecture Framework Metamodel (NMM) and Architecture Data Exchange (ADES)

The metamodel is a key enabler to architectural coherency. The coherence of the architecture is achieved by defining which architectural meta elements can be used in which NAF subviews - architects create an element only once and reuse it from subview to subview. This reuse of elements and the metamodel relationships between meta elements encourages the architect to produce 'joined up' architectures.

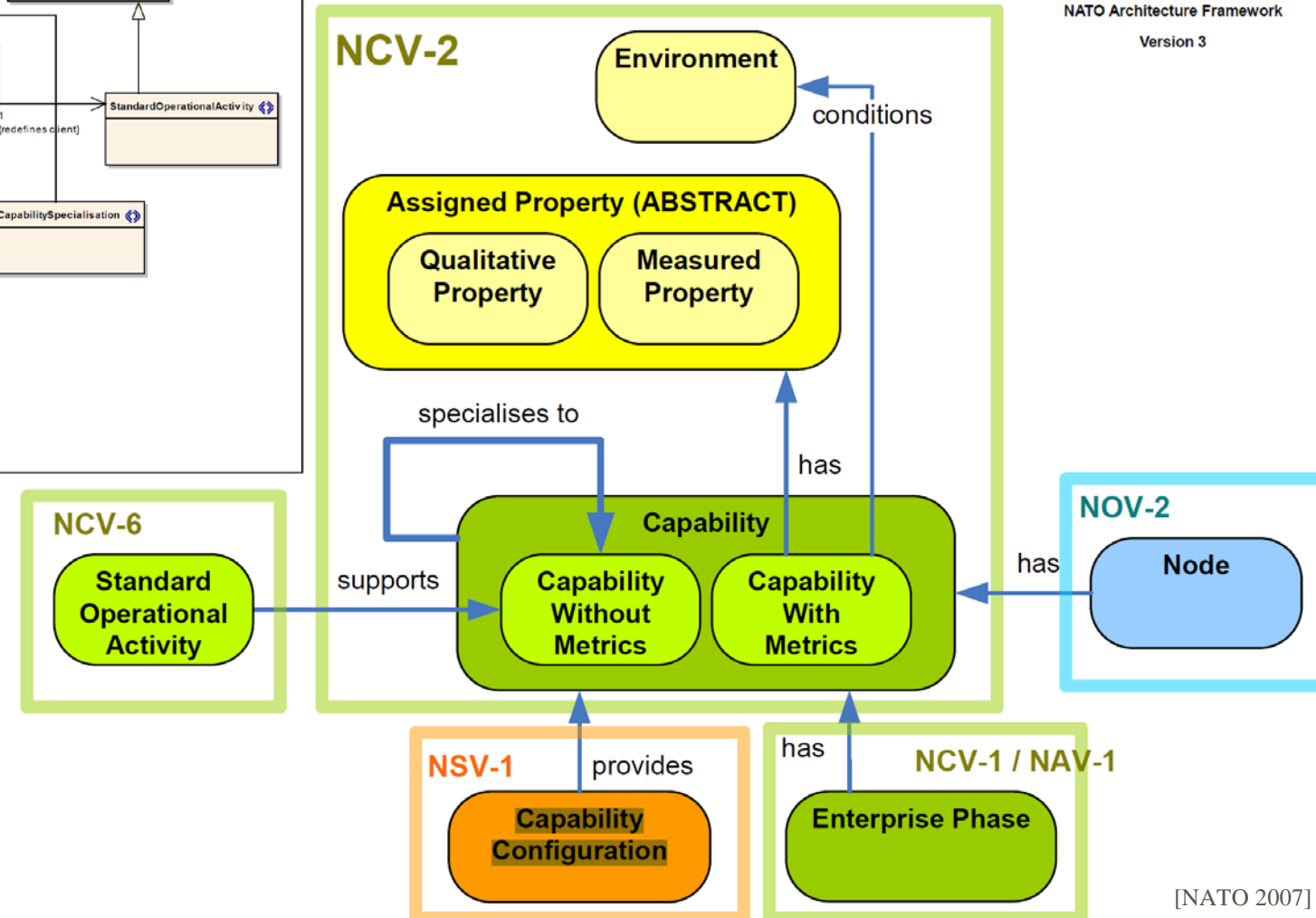
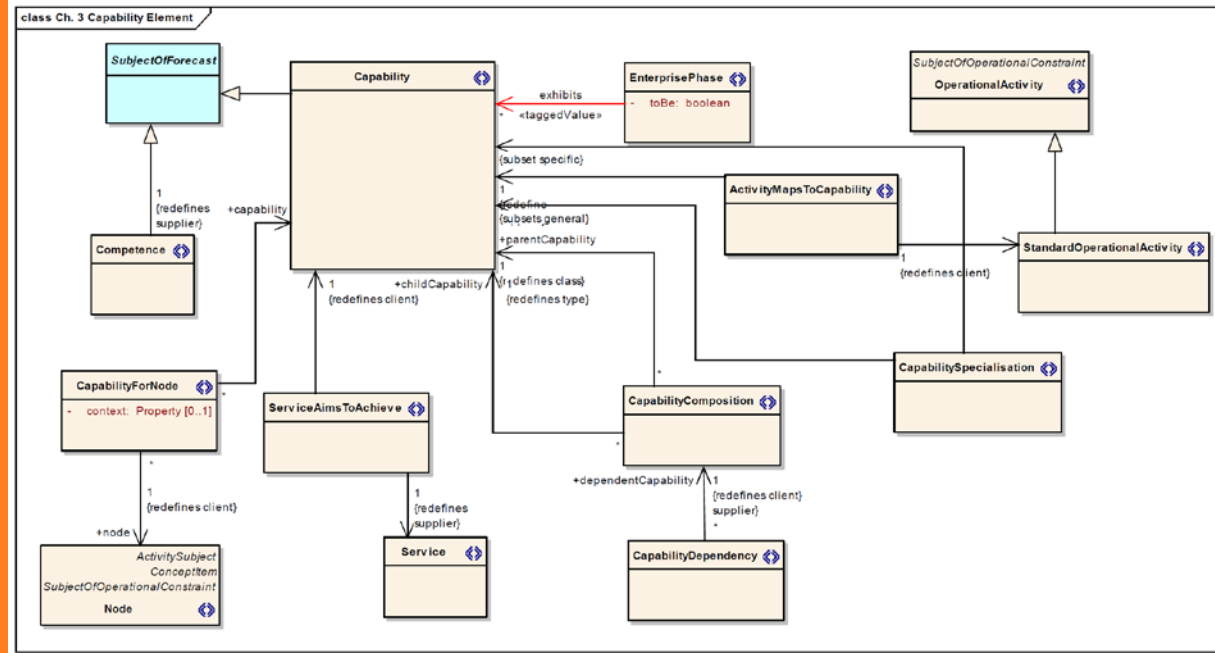
The metamodel provides the specification for XMI file interchange between NAF version 3 architecture tools, and may also be used as a specification for configuring repositories. The metamodel's role in data exchange and repository configuration is described in detail in this chapter, and XMI examples are provided where appropriate to assist implementers of the NAF.

The metamodel is defined as an extension to the UML 2.0 metamodel so that it may also act as a specification for UML profiles.



[NATO 2007]]

5.2.1.3 Ch. 3 Capability Element



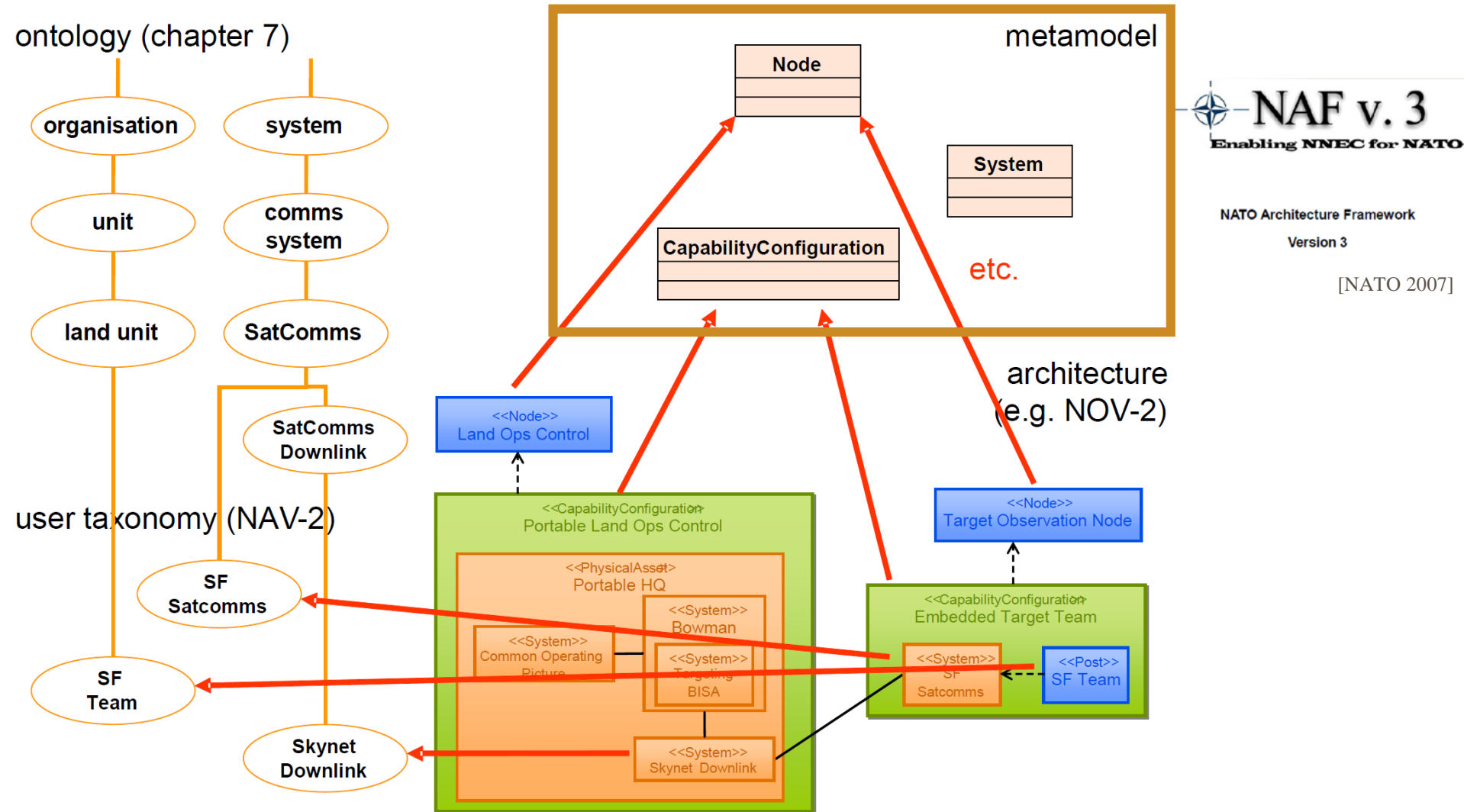


Figure 5-2, Relationships between domain ontology, domain taxonomy, architecture subview and NMM.

EA-Modelle – Modellierung/ Tools

Enterprise Architect is a sophisticated and flexible Enterprise Architecture platform that can be used as both an architecture repository and a tool for managing architecture projects. It can be used across the entire life cycle from setting up an architecture program or office to planning, managing, developing and documenting architectures through to the governance of implementation projects that consume the architectural output. The tool can be used with any single or combination of Architecture Frameworks, processes and languages of representation. There is a wide range of facilities and tools that allow the architect to work using their preferred methods such as Word Processor views, Spreadsheet views, Diagrams, Relationship Matrices or a range of other core and extended features.

[Sparx 2017]

AUG 7, 2014 @ 10:10 AM

115,495

2 Free Issues of Forbes

Enterprise Architecture: Don't Be a Fool with a Tool



Jason Bloomberg, CONTRIBUTOR

I write and consult on digital transformation in the enterprise.

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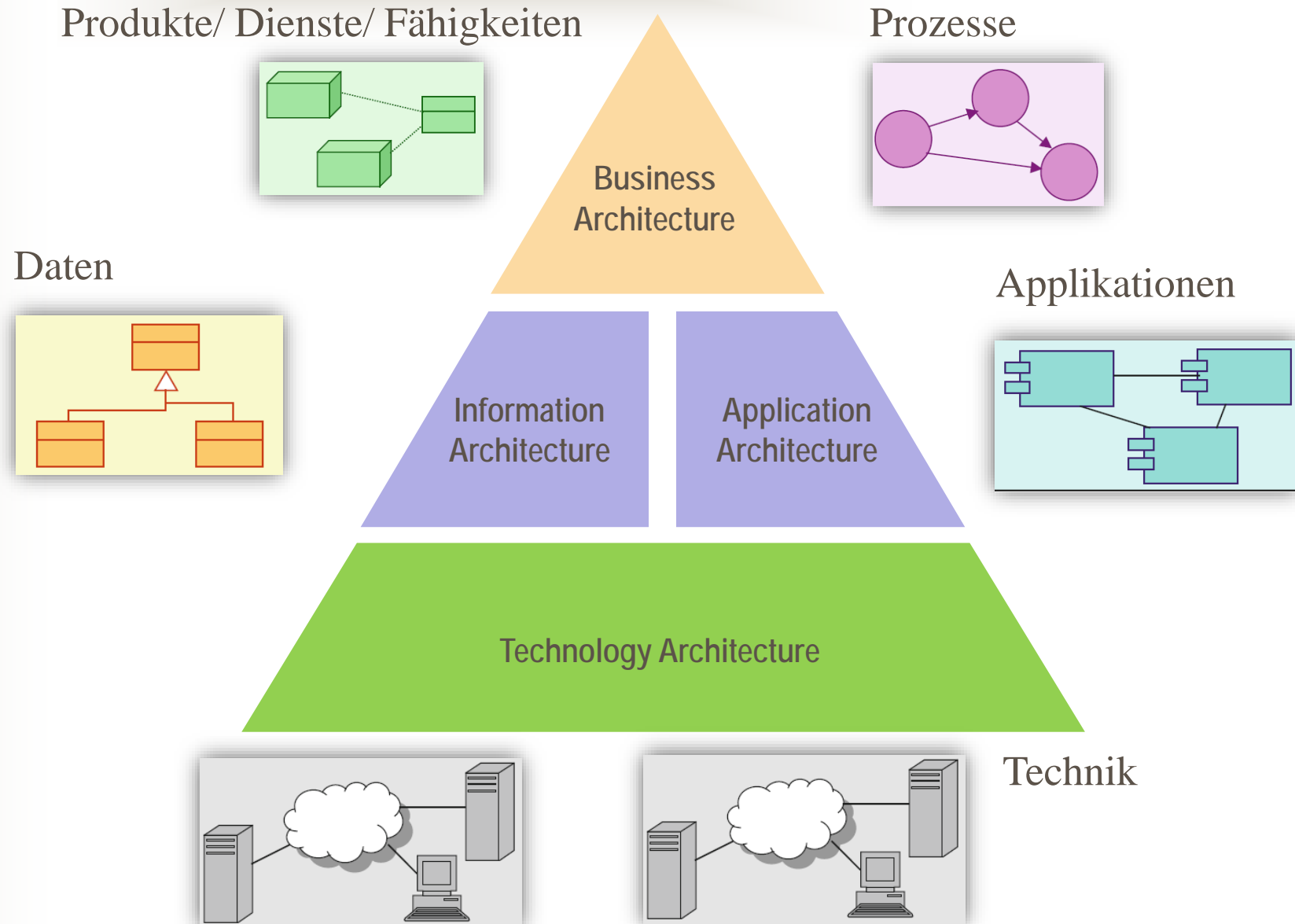
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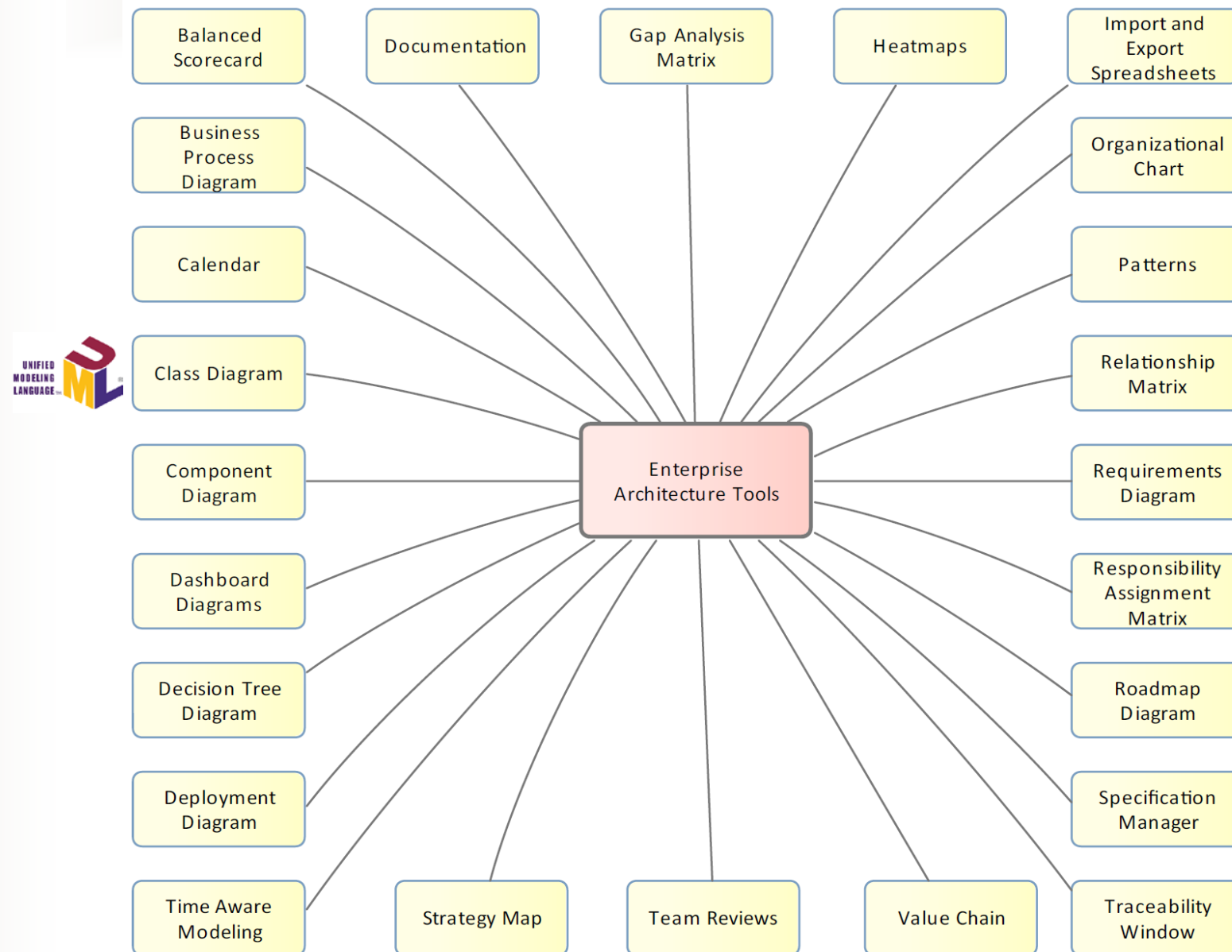
Quelle: <https://www.forbes.com/sites/jasonbloomberg/2014/08/07/enterprise-architecture-dont-be-a-fool-with-a-tool/#cbd562f78607>

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EA-Modelle – Heterogenität der Artefakte

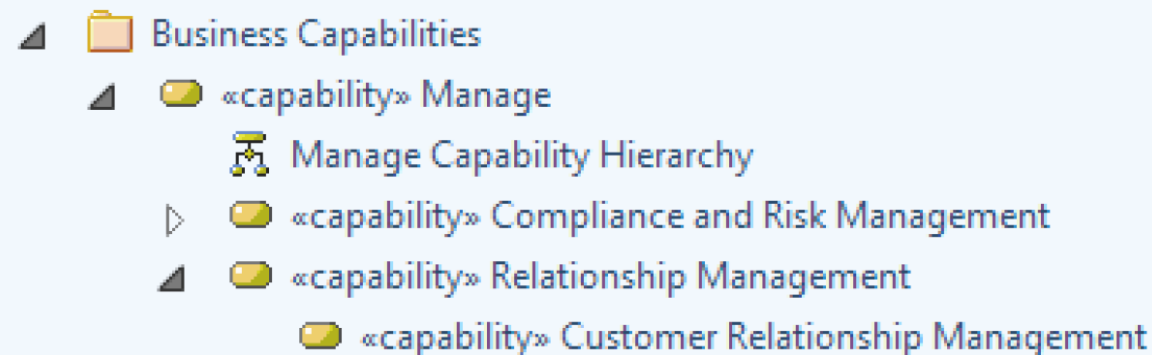


EA-Modelle – Methoden/ Beschreibungsformen



EA-Modelle – Methoden/ Beschreibungsformen

Enterprise Architect can be used to model Capabilities, including showing their relationships back to strategic concerns such as Drivers, Goals and Objectives. These relationships can be viewed in diagrams, the Relationship Matrix or list views, creating powerful communication mechanisms appropriate for executives, managers and other architects. The capabilities can also be related to tactical concerns such as business processes, logical and physical applications and services, and in turn technology devices and services.



Stereotyping



The Unified Modeling Language does not itself contain an element to represent a Capability or Capability Increment but they can be included by using stereotypes, which is a mechanism for extending the core language. These stereotypes can be applied to a base element such as a Requirement and then the stereotype can be applied to create new Capabilities or Capability Increments. The stereotype will be visible in the Project Browser and diagrams if these options have been set. Capabilities elements can become available if other Technologies or profiles have been enabled.

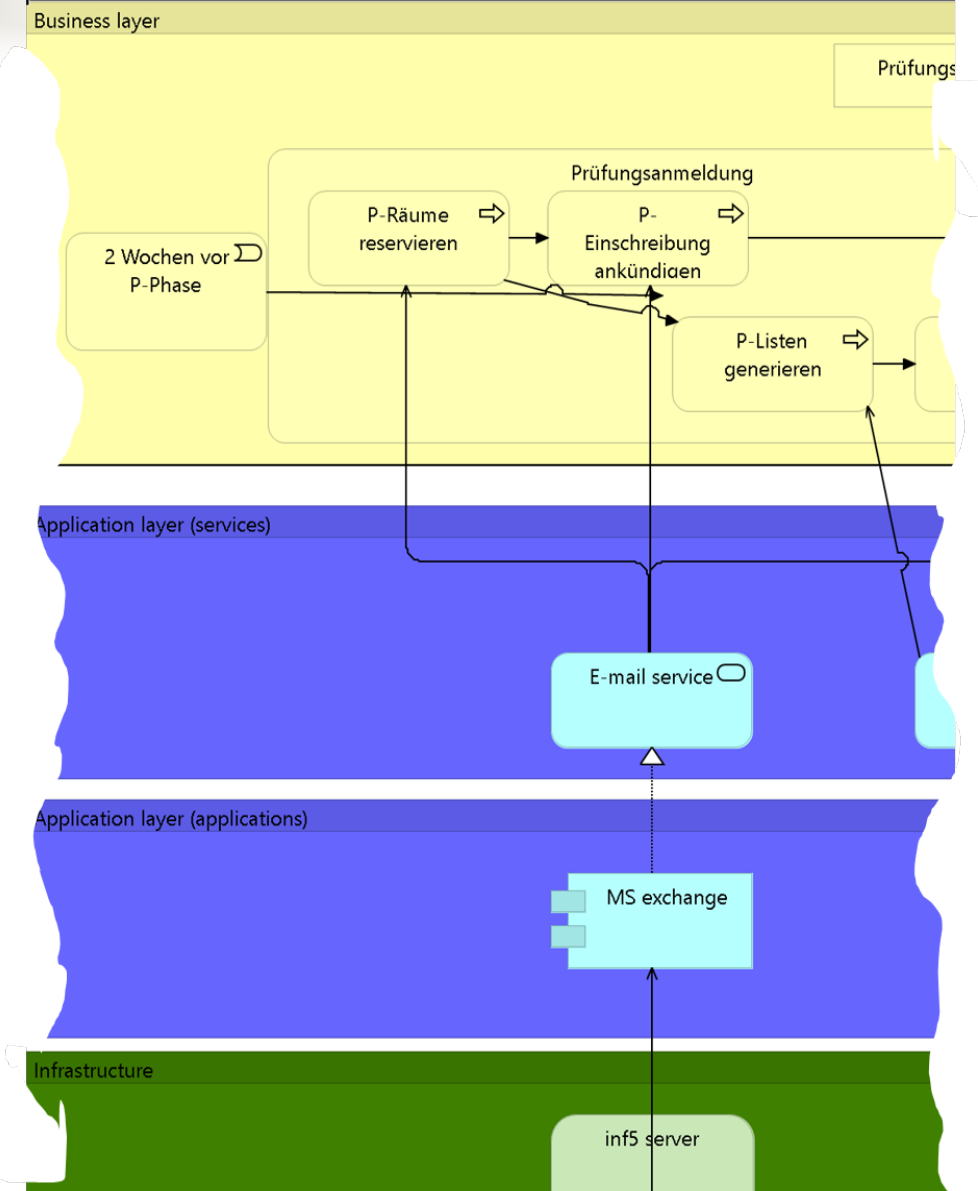
Learn More: [Stereotyping](#)

[Sparx 2017]

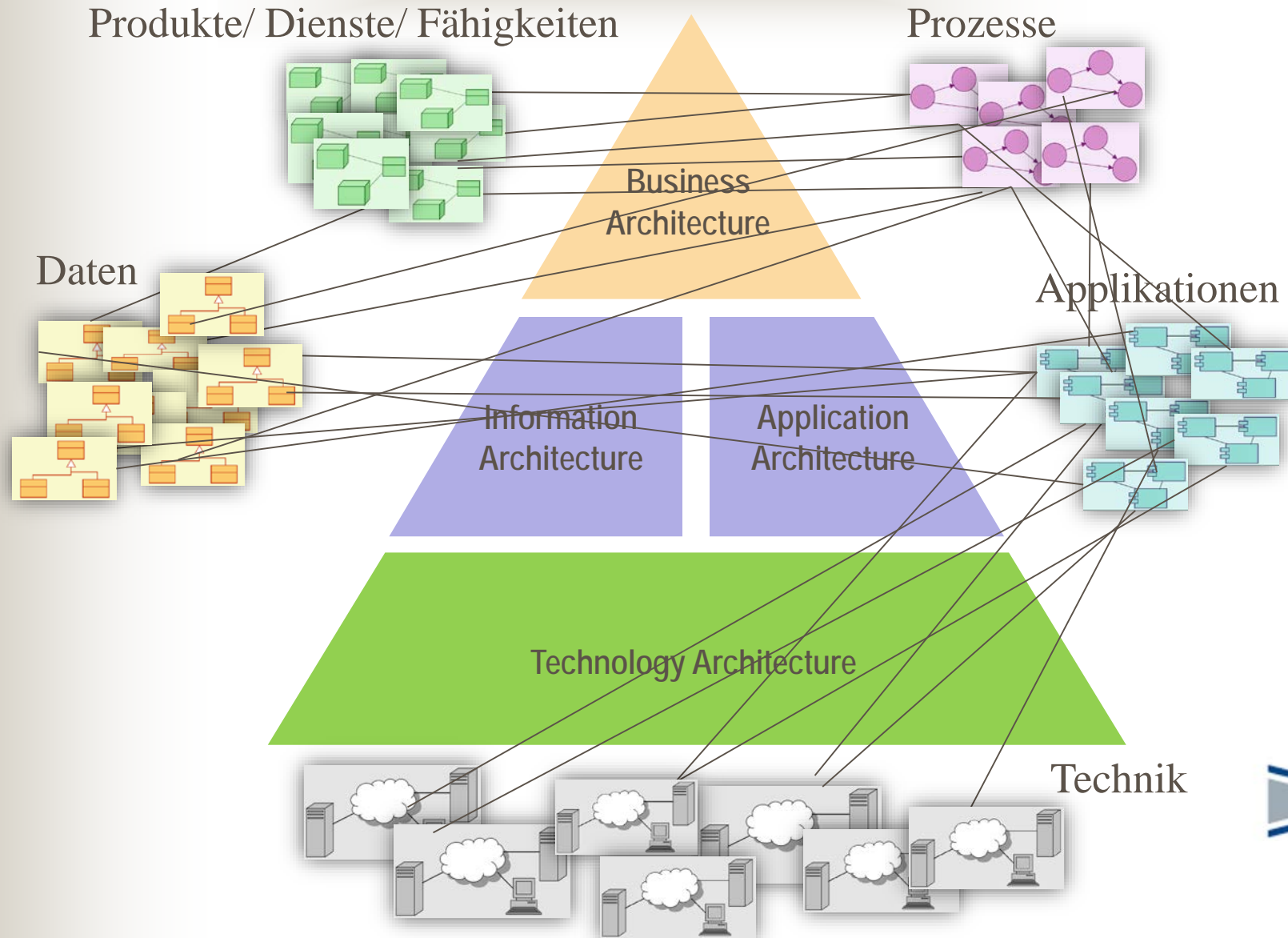
EA-Modelle – Methoden/ Beschreibungsformen

ArchiMate® 3.0 Specification

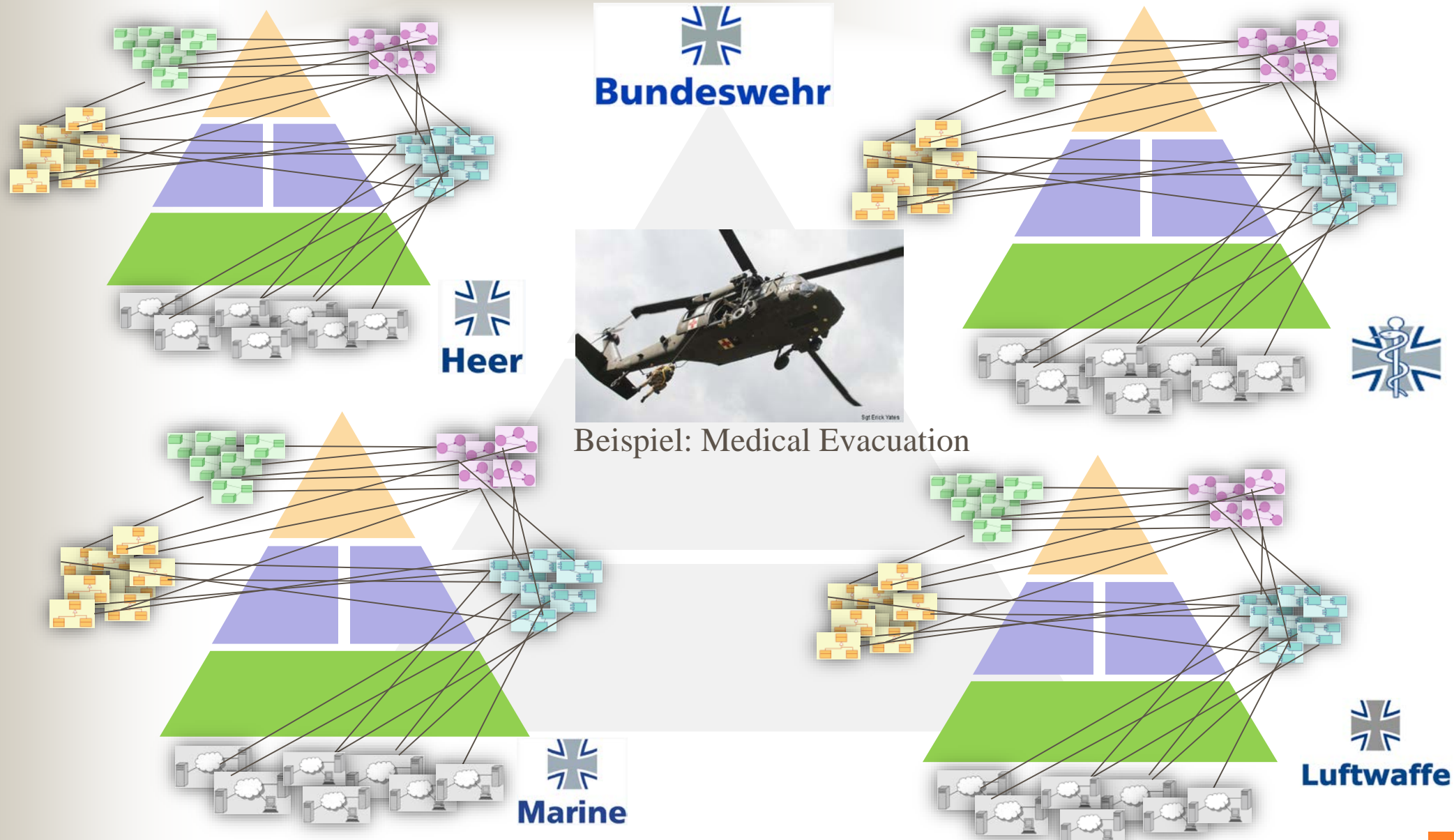
The **ArchiMate Enterprise Architecture modeling language** provides a uniform representation for diagrams that describe Enterprise Architectures. It includes concepts for specifying inter-related architectures, specific viewpoints for selected stakeholders, and language customization mechanisms. It offers an integrated architectural approach that describes and visualizes different architecture domains and their underlying relations and dependencies. Its language framework provides a structuring mechanism for architecture domains, layers, and aspects. It distinguishes between the model elements and their notation, to allow for varied, stakeholder-oriented depictions of architecture information. The language uses service-orientation to distinguish and relate the Business, Application, and Technology Layers of Enterprise Architectures, and uses realization relationships to relate concrete elements to more abstract elements across these layers.



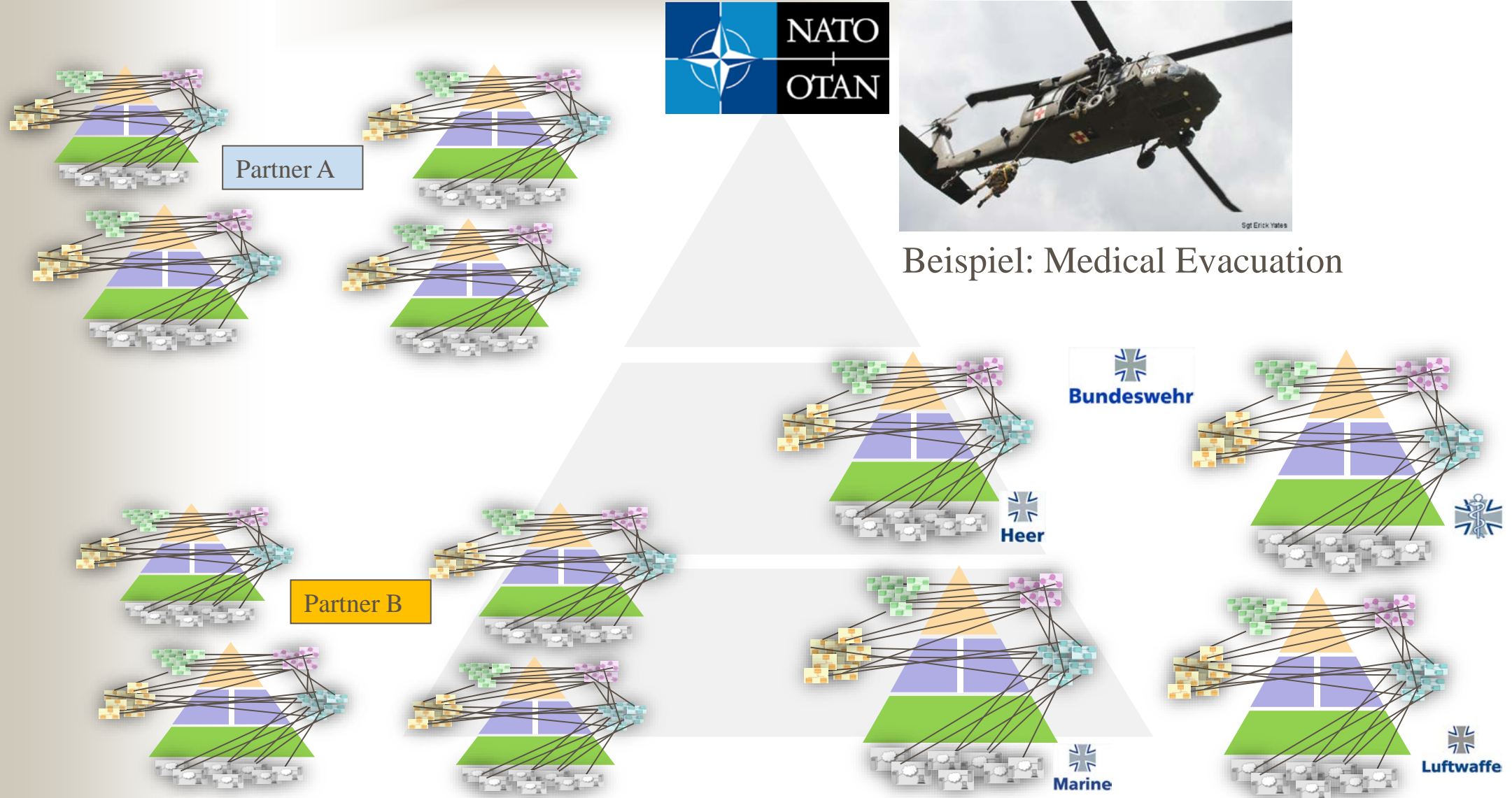
EA fördert – „Enterprise im Enterprise“



EA fördert – „Enterprise im Enterprise“



EA fördert – „Enterprise im Enterprise“



Zusammenfassung



ENTERPRISE ARCHITECTURE IS NOT THE ANSWER – IT IS PART OF THE ANSWER

Quelle <https://blog.opengroup.org/2017/09/07/enterprise-architecture-is-not-the-answer-it-is-part-of-the-answer/>
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📅 September 7, 2017 👤 The Open Group Blog 📁 Business Architecture, Business Transformation, Enterprise Architecture (EA), Information Technology, Interoperability, Standards, The Open Group, TOGAF®, Uncategorized

By Terry Blevins, Fellow of The Open Group, Enterprise Architect at Enterprise Wise LLC

Zusammenfassung

Terry Bromwich, Principal Enterprise Architect at National Air Traffic Services, explains some of the reasons for its success:

“It may sound obvious but organisations have limited success unless they take an Enterprise Architecture approach to their Enterprise Architecture. In the case of SESAR EATMA, a great deal of time was invested up front ensuring that the team were clear what was needed from the Architecture, who was going to use it and what data they needed.”

So, to succeed, an organisation should take an EA Approach to EA? That's so self-referential it's actually recursive! It's clear, however, that the focus is on the organisation, not the architecture. If in another twenty years EA has ceased to be accused of self-referentiality (i.e. the bad kind) it will be because EA practitioners have succeeded in demonstrating that **Enterprise Architecture isn't about building better architectures, but better enterprises.**

Quelle: http://www.integrated-ea.com/?page_id=275
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- *“Any problem in Computer Science can be solved with another level of indirection.”*
Butler Lampson
- *“...except the problem of indirection complexity.”* Bob Morgan



Quellen

- Ahlemann F. et al. (2012): Strategic Enterprise Architecture Management; Springer 2012; ISBN 978-3-642-24222-9
- Bundeswehr (2014): Leitfaden Anwendung der Methode Architektur in der Bundeswehr; Planungsamt der Bundeswehr, 2014
- Karcher A., Mihelcic G. (2017): Enterprise Architecture; in: WISU – Das Wirtschaftsstudium; Ausgabe Dezember 2017
- Lankhorst M. et al. (2017): Enterprise Architecture at Work: Modelling, Communication and Analysis; Springer 4rd ed. 2017
- NATO (2007): NATO Architecture Framework NAF Version 3.0; NATO 2007
- Schneider A. (2016): Decision Support for Application Landscape Diversity Management; Dissertation TU München; 2016
- Sparx (2017): Enterprise Architecture; Enterprise Architect User Guide Series; Sparx Systems 2017