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Initiative for Modeling the Legal Analysis Methodology

Service Architecture

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Abstract

This document provides a working definition of the architectural stance and design decisions that are to be adopted for the Legal Analysis Model maintenance and dissemination life-cycle and the supporting services. This process is aligned with the semantic asset publication workflow currently employed by the Standardisation Unit (SU) at the Publications Office of the European Union (OP).

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In the European Union, the public sector is one of the most open-data intensive sectors. The re-use of open data can contribute, for example, to the growth of the European economy, the development of artificial intelligence and overcoming societal challenges.

Given the increasing importance of data standards for the EU institutions, a number of initiatives driven by the public sector, industry and academia have been kick-started in recent years. Some have grown organically, while others are the result of standardisation work. The vocabularies and semantics that they are introducing, together with the technologies that they are using, all differ. These differences hamper data interoperability and thus its reuse by them or by the wider public. This creates the need for a common data standard for publishing public reference data and models, hence allowing data from different sources to be easily accessed, linked, and consequently reused.

The Public Sector Information (PSI) directive across the EU calls for open, unobstructed access to public data in order to improve transparency and to boost innovation via the reuse of public data. The reference data maintained and published by the Publications Office Office of the European Union (OP) has been identified as data with a high-reuse potential. Therefore, making this data available in machine-readable formats, as well as following the data as a service paradigm, are required in order to maximise its reuse.

In this context, the Publications Office of the European Union maintains and publishes an ever-increasing number of reference data assets which are vital in the context of inter-institutional information exchange, access, retrievability and re-use of information. With regards to reference data, the PO provides an ever-increasing number of services to the main institutional stakeholders and with the aim to extend them to a broader public, enabling active or passive participation in the reference

data life cycle, standardisation and harmonisation.

This document provides a working definition of the architectural stance and design decisions that are to be adopted for the asset publication life-cycle process. This process is materialised as the publication workflow and is currently employed by the Standardisation Unit (SU) at the Publications Office of the European Union (OP).

Contents

Chapter 1

Architecture building blocks

This chapter provides some foundations about the notation, definitions the general approach adopted here to model the enterprise architecture.

1.1 Methodology

In this document we take an enterprise architecture perspective and aim to provide several architecture views (see Section 1.2) which are necessary and sufficient to describe the asset lifecycle process.

In developing this architecture, we are in part using the TOGAF [4] methodology, which is, in fact, a framework for enterprise architecture that provides an approach for designing, planning, implementing and governing an enterprise information technology architecture. Although we do not follow this framework completely, we took inspiration from parts of it which were applicable to the goals of this architecture.

For architecture representation, we adopt ArchiMate language [5], which is an open and independent enterprise architecture modelling language to support the description, analysis and visualisation of architecture within and across business domains in a clear and unambiguous way.

We have conducted a series of interview with the SU management, the technical team and the business teams. In developing the motivation architecture, we entirely rely on the input from the SU management, presented in Section 2.

The business use cases represent the knowledge elicited from the technical team and the business teams and are presented in Section **??**.

The other layers of this architecture, are a gradual fleshing out of the use cases, and rely on the author experience of working a few years side by side with SU business (documentalists) and technical teams. This experience results in the knowledge of the applications and technical peculiarities of the SU.

The corresponding ArchiMate diagrams were modelled and designed using Enterprise Architect Tool [3]. Finally this report was written covering the overall architecture.

1.2 Architecture views

Architecture views are an ideal mechanism to purposefully convey information about architecture areas. In general, a view is defined as a part of an Architecture Description that addresses a set of related concerns and is tailored for specific stakeholders. A view is specified by means of an architecture viewpoint, which prescribes the concepts, models, analysis techniques, and visualisations that are provided by the view. Simply put, a view is what you see, and a viewpoint is where you are looking from [5].

An architecture view expresses the architecture of the system of interest in accordance with an architecture viewpoint (or simply "viewpoint"). There are two aspects to a viewpoint: the concerns it frames for the stakeholders and the conventions it establishes on views [5].

Viewpoints are designed for the purpose of communicating certain aspects and layers of an architecture. In this document we address the motivation view (Section 2), the business view (Section 3), the application view (Section **??**) and the technology view (Section **??**).

Instead of describing what each of these views represents in this section, we decided to provide such an description in the beginning of each of the subsequent sections. This way, we aim to ease the section reading by providing the reader a fresh introduction into the structure of a prototypical layer architecture before the actual SU architecture is described.

1.3 ArchiMate elements

This section presents the ArchiMate elements, in terms of their definition and the graphical notation, which we employ in each of the architecture views.

Table 1.1: Overview of the relevant motivation elements [5]

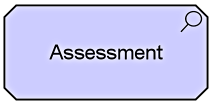
Element	Definition	Notation
Stakeholder	Represents the role of an individual, team, or organisation (or classes thereof) that represents their interests in the effects of the architecture.	
Driver	Represents an external or internal condition that motivates an organisation to define its goals and implement the changes necessary to achieve them.	
Assessment	Represents the result of an analysis of the state of affairs of the enterprise with respect to some driver.	
Goal	Represents a high-level statement of intent, direction, or desired end state for an organization and its stakeholders.	

Table 1.2: Overview of the relevant business layer elements [5]

Element	Definition	Notation	
Business actor	Represents a business entity that is capable of performing behaviour.		
Business role	Represents the responsibility for performing specific behaviour, to which an actor can be assigned, or the part an actor plays in a particular action or event.		
Business collaboration	Represents an aggregate of two or more business internal active structure elements that work together to perform collective behaviour.		

Table 1.2 continued from previous page

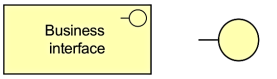
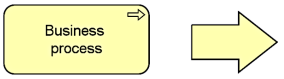
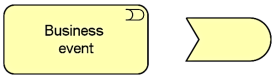
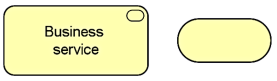
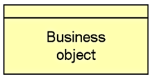
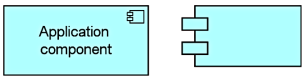
Business interface	Represents a point of access where a business service is made available to the environment.	
Business process	Represents a sequence of business behaviours that achieves a specific result such as a defined set of products or business services.	
Business function	Represents a collection of business behaviour based on a chosen set of criteria (typically required business resources and/or competencies), closely aligned to an organisation, but not necessarily explicitly governed by the organisation.	
Business event	Represents an organisational state change.	
Business service	Represents explicitly defined behaviour that a business role, business actor, or business collaboration exposes to its environment.	
Business object	Represents a concept used within a particular business domain.	
Representation	Represents a perceptible form of the information carried by a business object.	

Table 1.3: Overview of the relevant application layer elements [5]

Element	**Definition**	**Notation**
Application component	Represents an encapsulation of application functionality aligned to implementation structure, which is modular and replaceable.	

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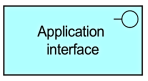
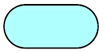
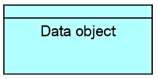
Application interface	Represents a point of access where application services are made available to a user, another application component, or a node.		
Application function	Represents automated behaviour that can be performed by an application component.		
Application process	Represents a sequence of application behaviours that achieves a specific result.		
Application event	Represents an application state change.		
Application service	Represents an explicitly defined exposed application behaviour.		
Data object	Represents data structured for automated processing.		

Table 1.4: Overview of the relevant technology layer elements [5]

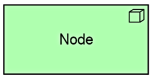
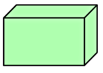
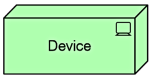
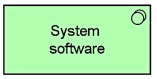
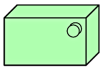
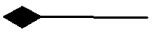
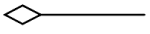
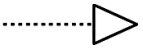
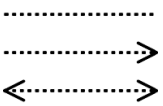
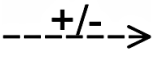
Element	**Definition**	**Notation**	
Node	Represents a computational or physical resource that hosts, manipulates, or interacts with other computational or physical resources.		
Device	Represents a physical IT resource upon which system software and artefacts may be stored or deployed for execution.		
System software	Represents software that provides or contributes to an environment for storing, executing, and using software or data deployed within it.		
Technology interface	Represents a point of access where technology services offered by a node can be accessed.		

Table 1.4 continued from previous page

Communication network	Represents a set of structures that connects nodes for transmission, routing, and reception of data.		
Technology service	Represents an explicitly defined exposed technology behaviour.		
Artefact	Represents a piece of data that is used or produced in a software development process, or by deployment and operation of an IT system.		

Table 1.5: Overview of the ArchiMate relationships [5]

Element	Definition	Notation
	Structural Relationships	
Composition	Represents that an element consists of one or more other concepts.	
Aggregation	Represents that an element combines one or more other concepts.	
Assignment	Represents the allocation of responsibility, performance of behaviour, storage, or execution.	
Realisation	Represents that an entity plays a critical role in the creation, achievement, sustenance, or operation of a more abstract entity.	
	Dependency Relationships	
Serving	Represents that an element provides its functionality to another element.	
Access	Represents the ability of behaviour and active structure elements to observe or act upon passive structure elements.	
Influence	Represents that an element affects the implementation or achievement of some motivation element.	

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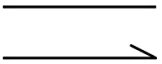
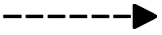
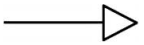
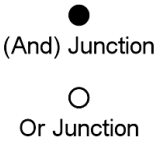
Association	Represents an unspecified relationship, or one that is not represented by another ArchiMate relationship.	
	Dynamic Relationships	
Triggering	Represents a temporal or causal relationship between elements.	
Flow	Represents transfer from one element to another.	
	Other Relationships	
Specialisation	Represents that an element is a particular kind of another element.	
Junction	Used to connect relationships of the same type.	

Chapter 2

Motivation architecture

This chapter presents the motivation and goal structure of the Documentary Management and Legal Analysis sector (OP.C.2.003) scoped to this project. This motivation structure is also presented in the context of the Publications Office, which scopes and documents the rationale of the initiative for modelling legal analysis methodology.

We do not aim for an in depth coverage of the motivation architecture here. So it cannot be considered as a fully fledged decision-making tool for the management. What we rather aim at is accounting for the context, stakeholders and their drivers and interests.

This motivation view helps address questions on why a demand is meaningful, model crucial drivers and root causes behind the demand, actual goals and related outcomes, as well as concrete requirements for further development. In short, it answers the crucial questions to WHOM, WHY and WHAT.

2.1 Prototypical motivation structure

The structure of motivations, in ArchiMate, is organised hierarchically in several layers. For simplicity, we have chosen to use the top four layers: *stakeholders, drivers, assessments and goals*; leaving out the *outcomes*, *principles* and *requirements*. Figure 2.1 depicts the organisation of the motivation architecture. The structure starts at the top with enumerating the stakeholders, who can be in-

dividuals, teams or organisations that represent their interests in the effects of the architecture [5].

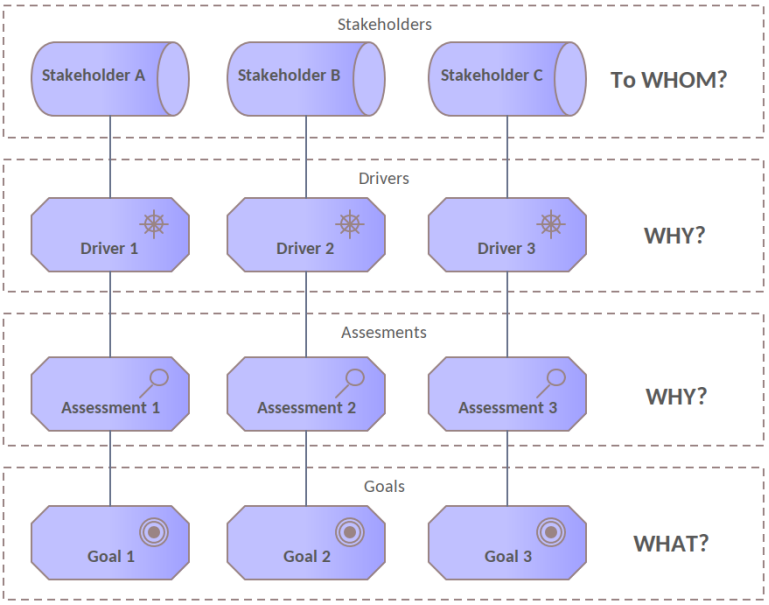


Figure 2.1: The layered motivation structure

Stakeholders have associated interests, concerns or drivers, which represent internal or external conditions that motivate an organisation to define goals [5].

Assessments represent results of analysis of the state of affairs with respect to a driver. They reveal strengths and weaknesses, opportunities or threats to an area of interest [5].

Assessments are associated with goals which represent a high-level statement of intent, plus direction to desired end state for an organisation and its stakeholders [5].

In the context of the current project the following stakeholders have been identified:

- OP legal analysis team (OP.C.2.003)
- Different OP services
- EU institutions
- LAM contractors

- Publications Office of the European Union (OP)

Next we present the motivation structure of spread over several sections addressing each stakeholder in part.

2.2 OP legal analysis team

The legal analysis team at the OP is the main stakeholder in this project. The main driver of this team is to establish a single point of access for the LAM data that can serve also as the single point of truth for this dataset. One particular feature that is of special importance is to to also link other various datasets on which LAM relies, such as Common Data Model (CDM) [1, 2], authority tables published at the EU Vocabularies[1], European Legislation Identifier (ELI) and others. The linked LAM information driver is a sub-goal to establishing a single point of access driver, and this is modelled via part-of relationship in Figure 2.2.

In the context of the project these two drivers are hindered by three issues. First, multiple sources of information published in an uncoordinated manner on disparate sources is difficult to access and consume. This is especially the case when the information available at decentralised data sources needs to be used coherently in combination with other data sources.

Another issue is that the meaning, rules and dependencies of the LAM model are sometimes not known by the stakeholders due to various reasons. One reason is the failure to find this information. Another reason is the informal explanation which may be incomplete, ambiguous or vague leading to multiple interpretations. And this leads to the third issue that the lack of precise formally defined knowledge is further propagated into the domain where LAM is applied and materialises as inconsistencies and mistakes in the data, system implementations, infrastructure configurations, exchange protocols and other aspects of the information systems.

To overcome these issues the goal of creating a central access point for the LAM data is adopted. This being the main goal of this project (LAM#2).

[1] `https://op.europa.eu/en/web/eu-vocabularies`

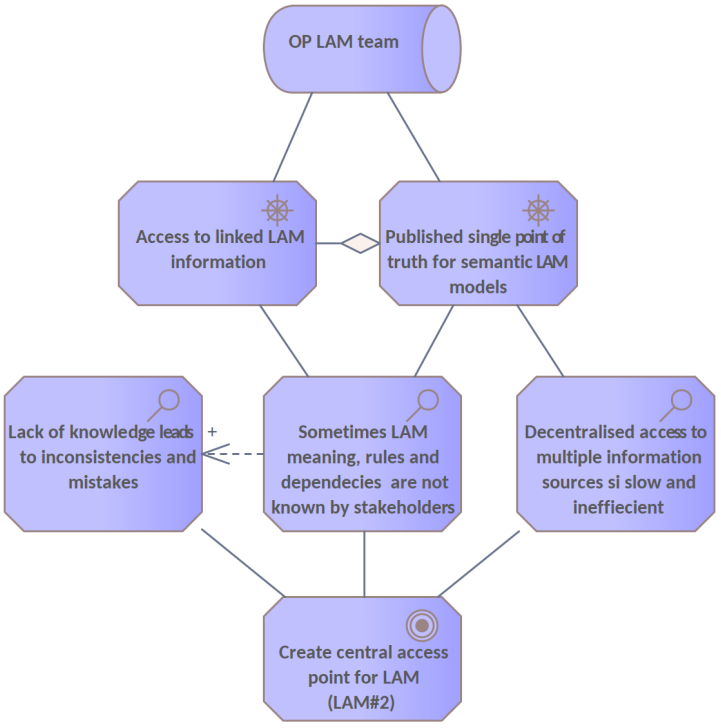


Figure 2.2: Motivation structure of the OP legal analysis team

2.3 Different OP services and EU institutions

At the Publications Office various internal unites and the services they expose operate with legal data and metadata. Having access to the semantic description of the OP legal data is of primary concern for these services collectively. This is schematically depicted in Figure 2.3.

Implementation of the single point of access for semantic LAM model can be conceptualised as a sub-driver for the need to access semantic descriptions of Op legal data and metadata, which is represented through an aggregation relation in Figure 2.3. Both motivations are hindered by the fact that decentralised access to multiple information sources is slow and inefficient. Moreover , LAM meaning, rules and dependencies are not always known to the interested stakeholders. To overcome these limitations, the current architecture aims at describing how a central dissemination point for LAM can be established.

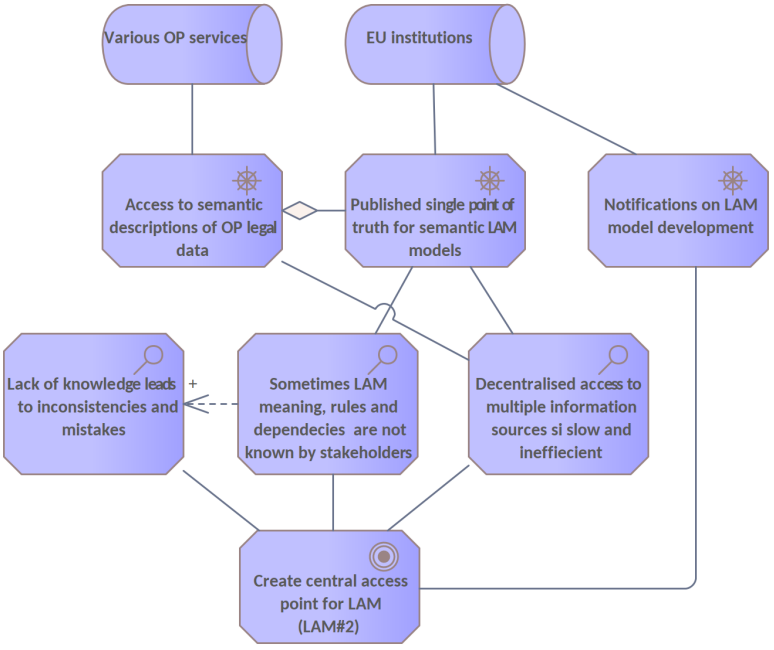


Figure 2.3: Motivation structure of different OP services

The EU institutions at large as a collective consumer of legal metadata definitions has the same needs as the OP services. In addition, a notification mechanism is desired to inform the interested players of changes and updates in the LAM data. This need materialises directly as a feature of the system to disseminate LAM data.

2.4 LAM contractors

The LAM contractors are a set of special stakeholders as they not only need to consult LAM data for information, but they are the agents that are actively involved in applying the specifications in practice. Often times, they will be those who inform the LAM team about possible issues in the LAM model or request extensions to it in order to accommodate new situations. The main driver for teh LAM consultants is teh consultancy on LAM and follow-up, depicted in Figure 2.4.

Traditionally, the LAM model was maintained as a MS Word document that is an unstructured (at least not for the machines) data representation. A direct consequence of this approach is that no automation, no validation or consistency checking

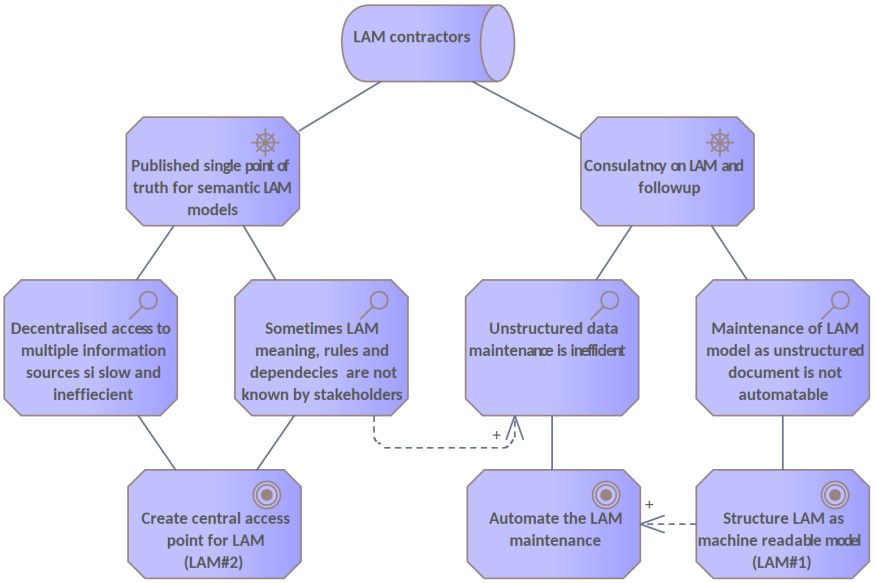


Figure 2.4: Motivation structure of LAM contractors

is possible with such representation. To overcome this limitation an initiative to structure LAM data into a machine readable model was performed at the end of 2019 (referred as LAM#1 project)[2].

Another issue is that as no machine assistance is possible to implement, the maintenance of these data becomes increasingly more difficult due to highly interlinked nature of the LAM model. This approach does not scale and is inefficient. Moreover the effect is amplified as sometimes the lam meaning, rules and dependencies are not known by the LAM contractors or even the LAM maintenance team. In order to overcome this limitation, a set of automation functionalities and processes shall be established. This automation is out of current project scope and shall be addressed elsewhere.

In the left side of Figure 2.4, the driver, assessments and goal are repeated from the sections above as they are central to the current project and therefore shared by all of the stakeholders.

[2]LAM#1 deliverables are available in the following GitHub repository `https://github.com/eu-vocabularies/lam4vb3`

2.5 Publications Office of the European Union

At the Publications Office of the European Union defines drivers at a higher level of abstraction; yet they are very relevant to mention because the current project contributes directly to those interests. Figure 2.5 depicts the motivation structure of the OP relevant to the context of the current project.

OP is interested in the semantic operability both, across EU institutions and the intra-institutional information systems. To increase the shared common conceptualisation captured by the data models, they need to carry a certain level of formality, semantics that shall be verifiable for completeness and especially for soundness. Unfortunately not all data are represented in machine readable format and even less is is based on semantic models.

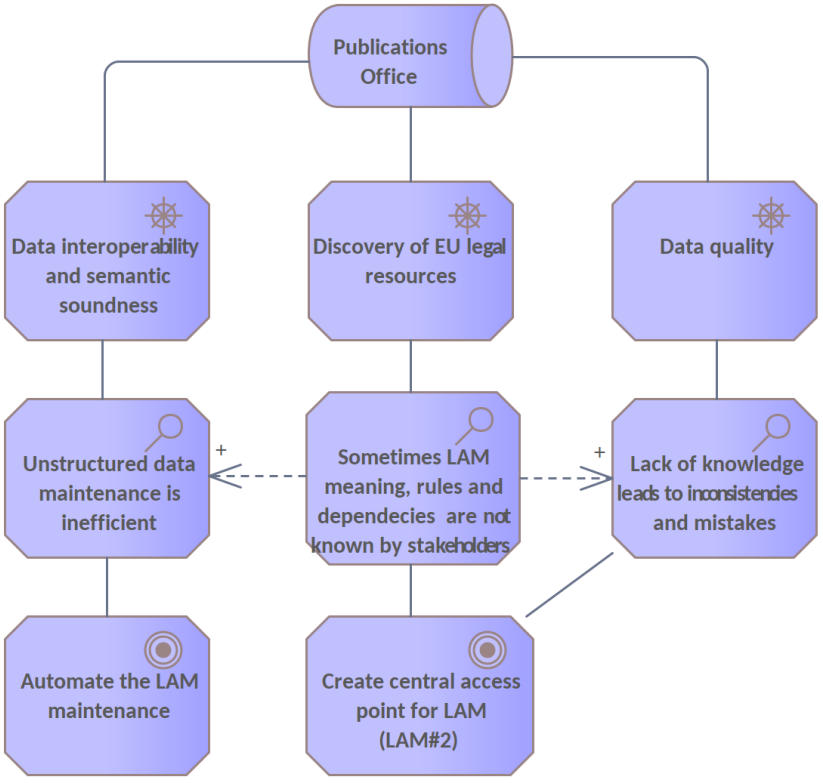


Figure 2.5: Motivation structure of the Publications Office of the European Union

Another broad OP interest is maintaining and increasing by possible means the data quality. Unfortunately, causes such as lack of or impaired access to knowledge, leads directly to inconsistencies and mistakes, which decrease the data quality. In order to overcome this limitation, creation of a central access point for LAM addressed to a large extent the problem of knowledge shortage.

Finally, a driver which is a the heart of the OP as an institution is to facilitate discovery of EU legal resources. In the context of the current project, this driver is hindered by inability to easily find and access LAM meaning, rules and dependencies. Therefore the the dissemination of LAM data shall be don in such a way that the relations to external data sources are presented in an intuitive manner and making such links easy to navigate. Moreover, an inventory of links to the most used resources shall be disseminate with the LAM data.

Chapter 3

Business architecture

This chapter addresses the business architecture aiming to describe the internal processes, events and roles answering questions concerning who shall do what and when.

This chapter first presents the baseline business architecture, as it is currently established and, then, presents a new (target) business architecture, as it is envisaged in the light of the digital transformation moving towards goals identified in the motivation structure (Section 2). The new business processes (see Section **??**) are aligned with use case descriptions from Section **??**. The latter are derived from materials describing the current workflow and interviews with the SU technical and business team members.

Beforehand, however, the description commences by explaining how a prototypical business architecture is structured that will serve as framework to better understand the diagrams in this chapter.

3.1 Prototypical business structure

Following the metaphor of layers presented in the motivation view (see Section 2.1), the organisation of business structure is also explained in terms of layers. Figure 3.1 depicts three layers with the most important elements of the business structure.

The topmost layer accounts for the external players or *actors*, which represent a business entity that is capable of performing behaviour and *roles*, which represent

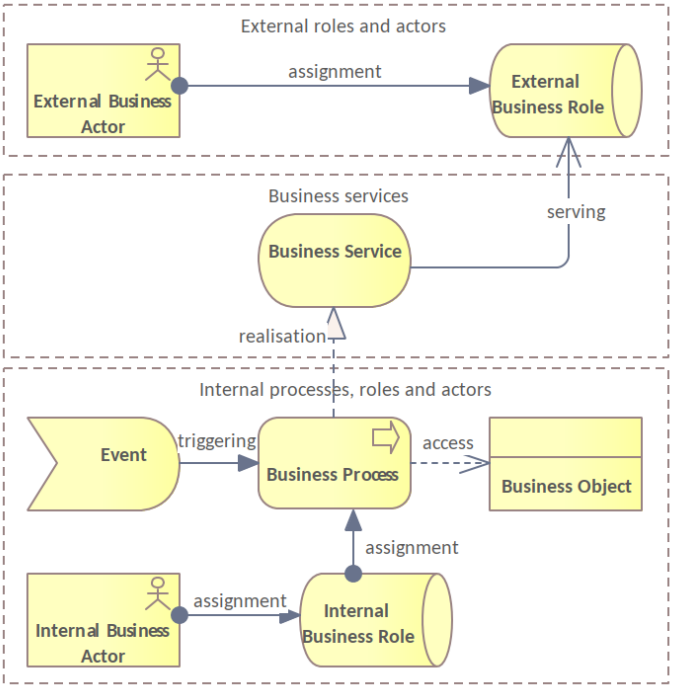


Figure 3.1: The prototypical business structure view

skills and responsibilities for performing specific behaviour, and to which an actor can be assigned [5].

The middle layer represents the *services* that are offered by the organisation to external players. A business service represents explicitly-defined behaviour that a business role, business actor or business collaboration exposes to its environment [5].

The lower layers accounts for the internal organisation in terms of *events*, *roles*, *processes* and *objects*. The business process represents a sequence of business behaviours that achieves a specific result such as a defined set of products or business services. The business event represents an organisational state change; while a business object represents a (passive) concept used within a particular business domain.

3.2 Organisation structure

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