The role of Enterprise Architecture Management to Govern Microservice Architecture adoption

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Abstract. Microservice Architecture (MSA) is an architectural style that aims to build a software application as a set of small services independently deployable. When adopting MSA, companies must drive some aspects that impact the organizational efficiency in order to guarantee: *(i)* the strategic benefits of the initiative; *(ii)* promote the best resources usage; and *(iii)* separate the essential decisions to enterprise architecture management (EAM) delegating other aspects to microservice teams. This paper assesses the relevant factors about MSA from the EAM view in order to propose an ArchiMate metamodel which enables enterprise architecture (EA) governance of MSA.

Keywords: Enterprise Architecture Management, Adaptive Enterprise Architecture, Adaptable Enterprise Architecture, Microservice Architecture, SOA

1 Introduction

Microservices are components that individually present low complexity, however, a microservice-based systems architecture becomes highly complex due to its heterogeneity of technology, volatility and high granularity [1]. Despite this complexity, it is important to manage the alignment and integration between the modeling of MSA based systems and the EA needs due to several factors, such as planning business capabilities, guaranteeing right investment levels, controlling costs, and ensuring compliance with the EA principles and needs. This paper investigates the relevant factors about microservice architecture (MSA) from the EAM perspective and design a metamodel based on TOGAF and ArchiMate to visually govern these aspects. Therefore, it aims to contribute to the development of enterprise architecture (EA) body of knowledge.

2 Background

Enterprise Architecture is widely covered in SOA, however the implications over microservice constraints require new views to accommodate the challenge of driving

MSA implementation without blocking innovations. Also, the Open Group has already developed a Microservice Reference Architecture [2], but at a high level and not presented in ArchiMate. In **Table 1** we summarize the most important MSA characteristics to EAM.

Table 1. Main characteristics of MSA related to EAM

Characteristic	Description
Decentralized Governance	Consists of the idea that a single team autonomously manages the entire microservice life cycle, including data governance [2]. However, governance at EA level is still needed, but it should not be intrusive.
Scalability	Multiple instances of the microservice can be created automatically in parallel, thus allowing to increase or decrease the number of instances according to demand [2][3]. It Implies that infrastructure costs will be vdddolatile, and these costs should be monitored and controlled at EA level.
Well-Defined Interface API	A microservice exposes a well-defined communication interface (API) with a published contract, which is exposed through an API gateway or proxy [2] [3]. As the API gateway is a cross component it must be governed at enterprise level.

Despite the high autonomy of microservices teams, EAM still needs to support teams on cross issues of services but playing a more consultative role than in traditional IT. It focuses on making recommendations instead of allowing or disallowing certain architectural decisions while still supporting cross-microservice architecture development, keeping track of permanent changes in IT architecture and providing information to enable cost transparency.

3 Proposal

Based on The Open Group MSA Governance Framework [2], we propose a diagram to clarify the concerns of EA and Microservice governance scopes, showed in **Fig. 1**. The idea is that any governance object that emerges should update this figure to visually guide what should be governed by EAM and what should not.

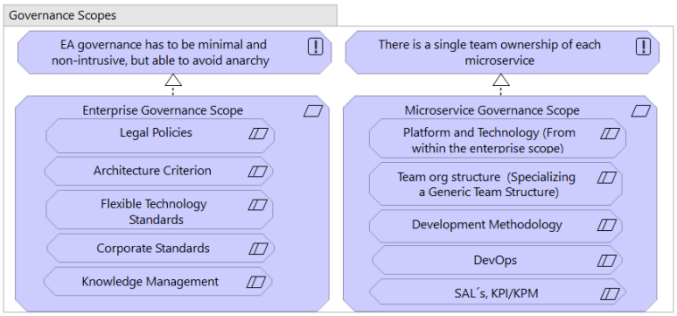

Fig. 1. Principles and Governance Scopes (Adapted from [2])

To help the microservice team to choose the best technology to implement their needs, the EAM model provides a catalog of some important technologies which

consider their relevance when it comes to knowledge and costs managements. **Fig. 2** is an adaptation of the model proposed by The Open Group [4] enriched by some other aspects provided by Yale et al. [3]. It exemplifies artifacts that represent governance recommendations or requirements for microservices, observing that everything inside of inner architecture is just a recommendation for microservices, aiming to avoid the risks in having too many technologies, but without restricting the innovation.

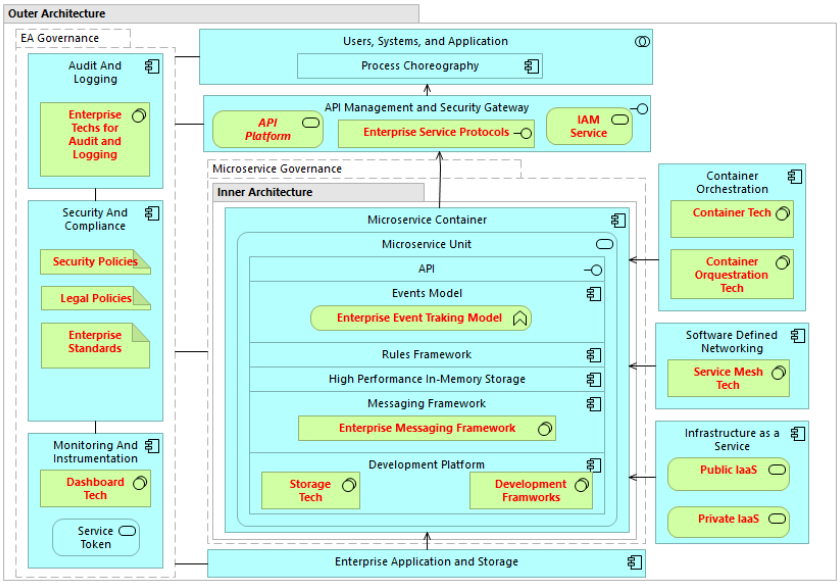

Fig. 2. Enterprise Microservice Reference Architecture

Keeping in mind that it is desirable to delegate as many decisions as possible to the microservice team, we propose the matrix in **Fig. 3** which defines the responsibilities of governance roles over each architectural property.

	Outer Architecture									Inner Architecture							
Governance Scope Matrix	**Users, Systems, and Application**	**API Management and Security Gateway**	**Monitoring And Instrumentation**	**Container Orchestration**	**Audit And Logging**	**Security And Compliance**	**Software Defined Networking**	**Enterprise Applications and Storage**	**Infrastructure as a Service**	**Microservice Container**	**Microservice Unit**	**Microservice API**	**Events Model**	**Rules Framework**	**High Performance In-Memory Storage**	**Messaging Framework**	**Development Platform**
Legal and Security Policies	ET	ET	ET		ET	ET		ET									
Architecture Criterion	ET	ET	ET	ET	ET	ET	ET	ET	ET	MT	MT	MT	MT	MT	MT	MT	MR
Technology Standards		ET	ET	ET	ET	ET	ET	ET	ET	MT	MT	MT	MT	MT	MT	MT	MT
Enterprise Standards	ET	ET	ET	ET	ET	ET	ET	ET	ET				MR			MR	MR
Knowledge Management										MT	MT	MT	MT	MT	MT	MT	MT
Platform and Technology										MR	MT	MT	MR	MT	MT	MR	MR
Team org structure											MR						
Development Methodology										MT	MT	MT	MT	MT	MT	MT	MT
DevOps										MT	MT	MT	MT	MT	MT	MT	MT
SLA´s, KPI/KPM										MT	MT	MT	MT	MT	MT	MT	MT

Fig. 3. Governance Scope Matrix

In this matrix the lines represent the governance concerns identified in **Fig. 1.** Principles and Governance Scopes (Adapted from [2])), and the columns architectural components and their relations identified in **Fig. 2.** Enterprise Microservice Reference Architecture). The cells indicate if the principal responsibility resides in Enterprise Team Governance (**ET**), autonomously in the Microservice Team (**MT**), or in the Microservice team within enterprise Restrictions or Recommendation (**MR**).

4 Conclusions and Future Work

The proposed solution resulted in an ArchiMate model defining principles, governance responsibilities, and a technology architecture view for MSA at EAM level. However, the assumptions made for the development of this paper regarding the existence of the difficulty for companies to maintain the alignment between MSA and EAM in relation to IT governance, as well as the aspects discussed and addressed to the EAM in the context of this paper, still need confirmation. Lastly, the model proposed should be applied and evaluated in a real case, and other theoretical strategies can be investigated to validate and enrich the solution.

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