Chapter 12

An Enterprise Interoperability Framework based on Compliance and Conformance

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ABSTRACT

The existing interoperability frameworks usually take an application-driven, top-down approach, in which the most relevant dimensions of interoperability are optimized for some problem space. For example, The European Interoperability Framework has been conceived primarily to support e-Government services. With the goal of contributing to the establishment of the scientific foundations of interoperability, this chapter presents a multidimensional interoperability framework, conceived in a generic, bottom-up approach. The basic tenet is to add an interoperability dimension (based on the concepts of compliance and conformance) to an enterprise architecture framework with lifecycle and concreteness as its main dimensions, forming a universal core framework. This core is then provided with an extensibility mechanism, based on a concerns dimension, into which the specific characteristics of applications and their domains can be added to instantiate the framework, now in an application-driven fashion. The most relevant concerns, with sufficient applicability breadth, can be promoted to full dimensions and extend the framework. The use of partial compliance and conformance reduces coupling while still allowing interoperability, which increases adaptability, changeability, and reliability, thereby contributing to a sustainable interoperability.

INTRODUCTION

Just as any other system, an enterprise is a composition of smaller systems that interact among themselves and with the outside world. In this respect, it must solve the same interoperability problems as any two systems that need to understand each other to achieve meaningful and useful collaboration. In fact, no enterprise can survive alone. It needs to interact with other enterprises and be part of a value network. This means that interoperability is one of the most fundamental issues that any enterprise must deal with, in all its main slants, namely:
Functionality: Guaranteeing that one enterprise understands the requests of another and reacts according to what is expected.

Non-Functional Aspects: Ensuring adequate service levels, resource management, security, and so on.

Coupling: Reducing it as much as possible, to avoid unnecessary dependencies.

Reliability: Maintaining interoperability, even in the presence of unanticipated failures.

Adaptability: Maintaining interoperability, even when partners change their characteristics.

What distinguishes an enterprise from other systems is not only its high complexity but also the need to redefine itself constantly and to carve its own place in the global enterprise ecosystem. Beating competition through constant renovation and evolution, playing the right cards by balancing factors such as innovation, quality, governance, competitiveness, marketing, customer satisfaction, and so on, is a matter of survival. Basic data interoperability is not enough. Enterprise collaboration demands higher levels of meaningful interaction.

There is no universally accepted definition of interoperability, since its meaning can vary according to the perspective, context and domain under consideration. Although limited to information, the 24765 standard (ISO/IEC/IEEE, 2010) provides the most cited definition of interoperability, as “the ability of two or more systems or components to exchange information and to use the information that has been exchanged.” We can generalize this by defining interoperability as “the ability of two or more systems or components to exchange stimuli and to react to them according to some pattern or contract that fulfills all partners’ expectations.” However, what does this really mean?

There are several frameworks and initiatives conceived to provide insight into what is involved in interoperability. However, most of these efforts attempt to classify interoperability by a single dimension, from high to low level. For example, the LCIM framework (Wang, Tolk, & Wang, 2009) uses the following levels: conceptual, dynamic, pragmatic, semantic, syntactic, technical and no interoperability.

The one-dimensional, layered approach to complexity in a framework is classic in software and communication systems. It has the advantage of simplicity but can only express the levels of detail, from more abstract to more concrete, and not the different natures of the various aspects and concepts involved. In addition, it does not provide a justification, or foundation, for the levels used in the framework, nor how they can fit a method or a maturity model, nor which are the conditions to actually achieve interoperability at each level, nor the implications for coupling and adaptability.

Other frameworks, such as the Framework for Enterprise Interoperability (ISO, 2011), resort to more than one dimension, but the extra dimensions pertain to the method that is used to solve the interoperability problem in some context or domain, not just to the framework. This is a consequence of the typical, application-driven approach of these frameworks, which start by defining the problem space (set of applications or systems in which the interoperability problems must be solved) and then derive the corresponding solution space, by establishing a set of guidelines to solve those interoperability problems.

This chapter presents an interoperability framework that takes a different, concept-driven approach. We start by defining a domain independent core, then we provide mechanisms to instantiate it to concrete applications and finally we extend it as required by those applications and their domain. This framework is applicable to any system, (be it simple or very complex, such as enterprises), in its interaction with other systems. It includes several dimensions that reflect orthogonal aspects and which are rooted on fundamental concepts, such as: