

White Paper

Achieving Coherence

in Architecture Models

WP0082 | June 2013



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The enterprise is a large, complex set of organizations, stakeholders, capabilities, products, processes, information, systems, technology and more. As enterprise architects, we try to bring some sense to all of this by embracing a framework that includes the different aspects of the enterprise, and then by creating models of the various different views.

Unfortunately, stakeholders from different perspectives often have a different understanding of certain aspects of the enterprise. These different understandings cause confusion, redundancy, inflexibility, inconsistency, and costs to the enterprise. But, if done carefully, we can start to expose these areas of incoherence in the enterprise in our architectural models and begin to drive toward a more coherent understanding.

What is Coherence?

The dictionary defines coherence as 'the quality of having internal consistency'. Wikipedia provides 26 different options for explaining coherence from physics, math, philosophy, computer science and more. I think the explanation from linguistics below is appropriate for the issues of the enterprise.

*"Coherence in linguistics is what makes a text semantically meaningful. Coherence is achieved through syntactical features such as the use of deictic¹, anaphoric² and cataphoric³ elements or a logical structure, as well as presuppositions and implications connected to general knowledge."*ⁱ

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¹ Deictic

Words or phrases that require contextual information to convey meaning

² Anaphoric

A type of expression whose reference depends upon another referential element

³ Cataphoric

To first insert an expression or word that co-refers to a later expression

So what does all that mean? I admit that I had to look up several of the words (definitions provided on the left), but basically it says that coherence is about semantic meaning being consistent. However, the challenge with being consistent is that the meaning depends on context and relationships (different perspectives), and on presuppositions (assumptions), and general knowledge (industry and enterprise history, culture, and context). Given that, is it any wonder why most

enterprises have such a problem with incoherence? And, given that, what could we do to make it better? We will see that by making these contexts, relationships, assumptions, and knowledge explicit, a more coherent enterprise can be achieved, and that architectural models provide one means of doing so.

Why do we Need it?

Every enterprise I've ever worked with suffers from lack of coherence to some extent or another. Because there is no overall view of the enterprise, knowledge is spread about, in many different places, in many different forms. In other words, understanding is fragmented with overlaps, gaps and inconsistencies, all of which depend on the perspective you are looking from. Without a 'big picture' view (i.e. architecture), putting this information together is left as an exercise to the individual. Perhaps this explains why there are so many different meanings and interpretations of the same concepts and so many different ways to do the same thing. The end results are inconsistencies, redundancies, misunderstandings, mistakes, missed opportunities, added complexities, and increased costs.

If you've ever done a modeling exercise with some subject matter experts (SME), you've probably run into the same experience I have. Even the 'experts' don't have the same understanding. In fact, I always try to get a few different SME together for a modeling session, just waiting for the discussion to happen.

SME1: "Blah, blah, blah..."

SME2: "That's not how it works"

SME1: "Oh yes it is"

SME2: "Oh no it's not"

...some time later...

SME1 and SME2: "Huh, so that's how it works!"

That discussion, by the way, is how we turn an interaction with architects from “I have to waste time with the architects again”, to “I usually learn something and gain clarity when working with the architects, and they leave me with a useful model to represent the new understanding”.

One reason for this is that a good model provides important new information. In the scenario above, the model captures information previously existing only in one SME’s head, and makes it available to everyone. Not just that, but, the model integrates that information together. Related concepts are presented together with the relationships and interactions between them being made explicit. In other words, integration results in the emergence of new understanding. Inconsistencies are highlighted (and hopefully resolved) and gaps are exposed. The new model provides a clearer, more complete and precise view than previously existed.

What is Required for Coherence?

So what are the things required to achieve this new insight and coherence? There are five prerequisites:

1. Visibility – We need complete visibility of the information. All important knowledge, concepts, ideas, and misconceptions must be known and available to be examined.
2. Knowledge – Everyone must have the same understanding of the important information. Misconceptions must be cleared up. Multiple meanings must be resolved. All concepts need to be unambiguously defined.
3. Integration – Once we have knowledge and visibility of the concepts, we need to bring them all together to identify and define the relationship and interactions. And just as there were many different understandings of the concepts themselves, we will discover different ideas about how they fit together which will need to be resolved, clarified, and unambiguously defined.
4. Understandability – The size of the enterprise is so large, and the scope of different concepts and relationships so broad, that it is impossible to grasp all of it at one time. To cope with this, we use two architectural techniques:
 - a. Abstractions – We generalize like concepts into a single higher-level abstraction so that we have fewer things to think about. At the same time, we suppress ‘irrelevant’ details to remove overload and noise. Note that while these two concepts are related, they are not the same.

b. Viewpoints – We present subsets of the overall big-picture in limited viewpoints that are focused on a particular perspective, concept, question, or stakeholder. These viewpoints are often overlapping, but are kept consistent. Note that we will also use abstraction within a single viewpoint.

5. Adaptability – In my last white paper “Five Rules of Effective Modeling”, the first rule of modeling states: “The first model is always wrong”. To achieve correctness, and hence coherence, we will need to iterate through the modeling process, making changes, additions, and corrections as we go. In addition, as more knowledge is obtained, as the scope of our big picture broadens, as things change, we will need to be able to easily and consistently update the models.

Diagram

A graphical representation of concepts and their relationships. The diagram is optimal for making multidimensional information understandable. The old adage ‘a picture is worth a thousand words’ is true for most people. However, a diagram lacks explicit and unambiguous definitions of the elements (concepts), leaving room for multiple, divergent interpretations, clearly an issue for coherence.

Dictionary

A dictionary provides explicit textual definitions. The dictionary is optimal for making concepts unambiguous and providing a consistent interpretation of them. However, a dictionary does not provide an integrated view, nor show relationships and interactions, again an issue for coherence.

How do we Achieve it in Models?

The use of viewpoints is an important technique, but also where we often run into problems. To understand this, we need to examine two common types of descriptions, a diagram, and a dictionary.

Each alone is necessary, but not sufficient to achieve coherence. Diagrams present without defining, dictionaries define without presenting. So, now is the time for another fundamental architectural principle, the separation of concerns. In our modeling, we want to decouple the semantics, the meaning of elements, from the presentation, how those elements are depicted.

This separation is even more important when we consider that the same element can be represented on many different diagrams. Its presentation may be the same, or different, depending on the diagram, but the meaning must be the same, regardless of the presentation or viewpoint (diagram). The model element itself must hold all the semantic information (definition), while each diagram element can determine what subset of information to show, how much detail is relevant, and how to present it.

This is where the proper use of a modeling tool is so important to achieving coherence, and one key difference between a drawing and a model. A modeling tool provides rigorously defined semantics, understandability via different viewpoints, and adaptability.

But, more than just a good tool is required to achieve adaptability. Adaptability requires eliminating redundancy so that there is only a single

place to change any one thing. In other words, the crux of assuring coherence in an architectural model (or set of models) is to avoid redundancy in the semantic definitions. This requires a different approach to creating models than most organizations currently take. Rather than creating many different viewpoints, which inherently will represent different interpretations, and then trying to bring them together to represent the whole, a coherent modeling approach describes the whole using a single, non-redundant semantic representation that is presented through many different viewpoints. A fundamental difference is that a single definition can be managed to achieve adaptability and coherence, while many separate representations cannot.

Creating Multiple Views with no Redundancyⁱⁱ

Since coherence requires both multiple views and no redundancy, how do we go about managing our models and modeling process to achieve this?

1. Take a big-picture, **system perspective**. Treat all views and definitions as a single system.
2. Achieve understanding but **using as many views (diagrams) as necessary**.
3. **Define every element** used in a view independently of the view, and manage the elements so none is ever defined more than **once** within the system.
4. **Separate the functions of definition and presentation**. Define all semantics (but no presentation) for each element. Define all presentation (but no semantics) for each view.

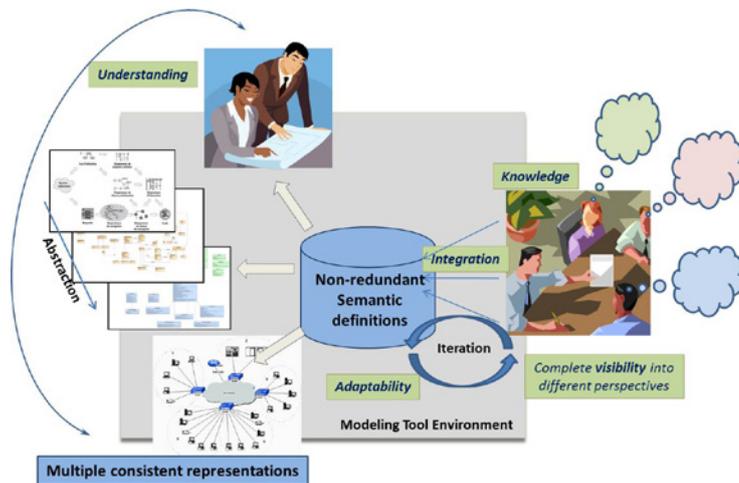


Figure 1 - Achieving Model Coherence

Conclusion

Enterprises suffer from confusion, redundancy, inflexibility, inconsistency, and unnecessary costs because of fragmented knowledge and lack of coherence. Although architecture cannot address all of the forces that cause this to happen, it can provide help. Architectural models can bring clarity and consistency in understanding. With that consistency, enhanced knowledge of relationships and interactions can emerge. This requires us to think differently about how we model the

enterprise. As shown in *Figure 1*, the key to coherence is to provide as many different views as is necessary to achieve understanding, while having a single non-redundant semantic definition. Getting to that single definition is what architects can accomplish using visibility, knowledge, integration, understanding, iteration, abstraction, with a modeling environment that supports adaptability.

ⁱ Wikipedia - [http://en.wikipedia.org/wiki/Coherence_\(linguistics\)](http://en.wikipedia.org/wiki/Coherence_(linguistics))

ⁱⁱ The Ideal of Coherence, Thomas Marzolf, Cutter Consortium Executive Report on Business and Enterprise Architecture, Vol. 15, No. 4.

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