Chapter X
The Whole Shebang: The Integrated Metamodel of Knowledge

ABSTRACT

This is the final chapter of the book. It describes the overarching structure of knowledge. This chapter provides an overview of the interactions between the fractured meanings normalized by each metaobject. It shows how the entire scheme is integrated into one unified context, which leads to the concept of Knowledge itself. Wherever knowledge and meaning exist, we will find their generic components configured in this manner.

"…impose thine awe upon all thy works and thy dread upon all that thou has created…that they may form a single band to do thy will with a perfect heart"

-extract from a Jewish prayer at Rosh Hashanah

WHAT IS THE MODEL OF KNOWLEDGE AND WHY IS IT USEFUL?

Knowledge is the understanding of meanings, reasons, and rules. In preceding chapters, we have seen how it starts with the recognition of *Pattern* and is based on reasoning, inference, understanding, and predictability. It is coordinated information that has a structure. The concept of a pattern is the cornerstone of Knowledge, and recognizing this helps us integrate reasoning, business rules, business processes, and ontology into one holistic pattern we have called the Metamodel of Knowledge in this series of books.

Each pattern in this book and its companions describes the components from which knowledge is assembled. These patterns are not isolated islands of meaning. Each is only a window into the overall pattern of information that describes the very meaning of Knowledge. The overall pattern would be impossible for a single human

mind to grasp in its entirety unless it is presented piecemeal—a few concepts and relationships at a time. Thus, each is also a window into the whole. Although every concept may not be present in every diagram in this series of books, each affects the others through relationships and interactions that are hidden in that figure. Figure 10.1 shows, at a high level, the overall interaction between these parts. The behavior of the entire structure, its complex interactions, and configurations is best stored in electronic Knowledge Artifacts and managed by automation. These Knowledge Artifacts will facilitate the operation of the 24 Hour Knowledge Factory we described in Chapter I.

The objects and semantic models in this book can help identify irreducible facts. They are the shared, generalized patterns that provide templates for mapping the irreducible facts of knowledge and meaning and can thus assist in the parsing of knowledge (the patterns in its companion book from Artech House Publishers can help parse business rules to identify its atomic components). The ontology and the semantic models in this book also lend the model power to reason. For instance, Figure 7.27 describes the ontology of location and containment. That chapter described why containment relationships are transitive when joined together. Thus, if it is known that a person lives in a house and the house is located in a town, it may be automatically inferred that the person lives in the town. Box 7.9 had another example of pattern based automated reasoning. Thus, the patterns in this book and its companions can be a cornerstone for the Semantic Web.

Sometimes, this reasoning defies human intuition. However, it is always mathematically correct and logically consistent. For instance, consider the question: can a part equal a whole? The intuitive answer is that it cannot. However, we have seen that when we deal with infinite numbers, a part may equal the whole. Consider Figure 7.27b. If the envelope that contained Objects 2 and 3 were infinitely extended, containment would be meaningless, and the asymmetry of "part of" could become "unknown." In some situations, it could behave symmetrically like "locate" does (see the notes at the end of Chapter VI. This is consistent with the fact that an asymmetrical relationships may be derived from symmetrical relationships by adding information, and "part of" can lose its asymmetry as we increase the freedom of the pattern and reduce its constraints and information content by extending the pattern to infinity in information space). The following example shows one instance of how this could happen.

Consider a triangle like that in Figure 1.2. Imagine it is cut in two by a horizontal line like one of the boundaries between the segments in the figure. This line is shorter than the base of the triangle. The side of the triangle connects the one end of the shorter line to the one end of the base. Take a point on the shorter line that is close to this end. You can draw a line from that point to a point on the base that is close to the end of the base. Repeat this until you reach the other end of the shorter line and the base. Now do this for the points in between those you have connected. You can continue the procedure an infinite number of times because there are an infinite number of points on each line. You will always find a point on the base that corresponds to a point on the shorter line. However, if you superimposed the shorter line on the base, it would only be a part of the larger line that represents the base of the triangle. This implies that the points on the shorter segment are only a part of the points on the full base. On the other hand, we have also shown that every point on the base has a corresponding point on the shorter segment. This has happened because containment and "part of" may become symmetrical relationships like "locate" when patterns of infinite extent are considered, and an infinite part of an infinite pattern may contain the whole pattern. This is not intuitively obvious to us because we cannot easily understand the infinitely large or infinitesimally small. However, the semantics of knowledge implied and anticipated it.