

O(G), the order of growth

Back in the day, we thought about the “order” of algorithms, analyzing the performance of sorting, say, in terms of the time it takes to sort a set of a certain number of elements. Whole books have been written on the subject.

The same applies for architecture. Polling, for example, works well for a small number of elements, but is a response-time disaster as the number of items increases. Organizing everything around interrupts or events works well until they all go off at once. Beautiful architectures consider the direction of likely growth and account for it.

Resist entropy

Beautiful architectures establish a path of least resistance for maintenance that preserves the architecture over time and so slows the effects of the Law of System Entropy, which states that systems become more disorganized over time. Maintainers must internalize the architecture so that changes will be consistent with it and not increase system entropy.

One approach is the Agile concept of the *Metaphor*, which is a simple way to represent what the architecture is “like.” Another is extensive documentation and threats of unemployment, though that seldom works for long. Usually, however, it generally means tools, especially for generating the system. A beautiful architecture must remain beautiful.

These principles are highly interrelated. One fact in one place can work only if you have automatic propagation, which in turn is effective when the architecture takes construction into account. Similarly, constructing engines and minimizing mechanisms support one fact in one place. Resisting entropy is a requirement for maintaining an architecture over time, and it relies on the architecture including construction and support for propagation. Moreover, a failure to consider the way in which a system will likely grow will cause the architecture to become unstable, and eventually fail under extreme but predictable circumstances. And combining minimal mechanisms with the notion of constructing engines means that beautiful architectures usually feature a limited set of patterns that enable construction of arbitrary system extensions, a kind of “expansion by pattern.”

In short, beautiful architectures do more with less.

As you read this book, ably assembled and introduced by Diomidis Spinellis and Georgios Gousios, you might look for these principles and consider their implications, using the specific examples presented in each chapter. You might also look for violations of these principles and ask whether the architecture is thus ugly or whether some higher principle is involved.

During the development of this Foreword, your authors asked me if I might say a few words about how someone becomes a good architect. I laughed. If we only knew that.... But then I recalled from my own experience that there is a powerful, if nonanalytic, way of becoming a