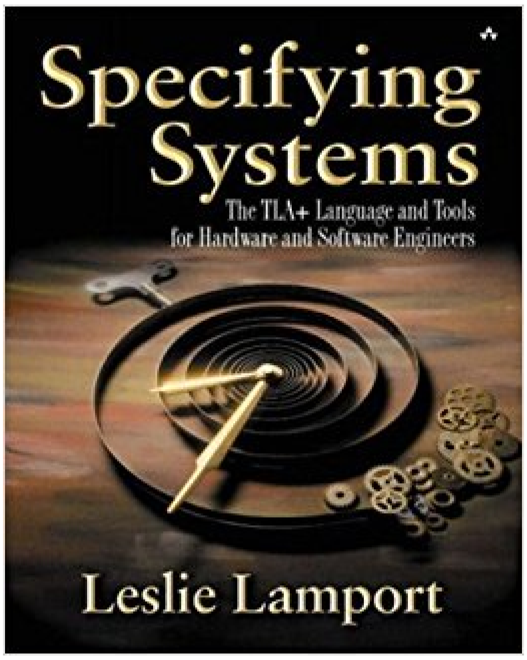
Specifying Systems: The TLA+ Language And Tools For Hardware And Software Engineers


Specifying Systems
The TLA+ Language and Tools
for Hardware and Software Engineers
Leslie Lamport

Synopsis

This work shows how to write unambiguous specifications of complex computer systems. The first part provides a concise and lucid introduction to specification, explaining how to describe, with mathematical precision, the behavioural properties of a system - what that system is allowed to do. The emphasis here is on safety properties. The second part covers more advanced topics, including liveness and fairness, real time properties, and composition. The books final two parts provide a complete reference manual for the TLA+ language and tools, as well as a mini-manual.

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Customer Reviews

"TLA+ represents the only effective methodology I’ve seen for visualizing and quantifying algorithmic complexity in a way that is meaningful to engineers." --Brannon Batson, Processor Architect, Intel Corporation This long-awaited book shows how to write unambiguous specifications of complex computer systems. The first part provides a concise and lucid introduction to specification, explaining how to describe, with mathematical precision, the behavioral properties of a system--what that system is allowed to do. The emphasis here is on safety properties. The second part of the book covers more advanced topics, including liveness and fairness, real-time properties, and composition. The book’s final two parts provide a complete reference manual for the TLA+ language and tools, as well as a handy mini-manual. TLA+ is the language developed by the author for writing simple and elegant specifications of algorithms and protocols and for verifying the correctness of a design. The language already has proved to be a valuable aid in understanding and building concurrent and distributed systems. Tools for TLA+ syntax analysis and model checking are freely available from the Web, where you can also find supplemental materials for this book, including exercises.   032114306XB06262002

Leslie Lamport, a computer scientist, is well known for his contributions to concurrent computing and distributed systems. His "Time, Clocks, and the Ordering of Events in a Distributed System" paper has been honored for its enduring influence on the field. Lamport is also known for creating the LaTeX typesetting system and the best-selling book, LaTeX, Second Edition, which documents it (Addison-Wesley, 1994). Now at Microsoft Research in Mountain View, California, he began his work on TLA+ at the Digital (later Compaq) Systems Research Center in Palo Alto. Lamport, who earned his Ph.D. in mathematics from Brandeis University, is a member of the National Academy of Engineering.   032114306XAB06262002

One of the best books I have ever read on any topic. Even if you don’t care about the subject matter (modeling and model-checking), the blazing clarity and simplicity will delight you. Classically reductionist, it boils all the complexity of systems (including distributed, concurrent, parallel, Byzantine systems, the kinds of things that send most practitioners running away in horror) down to a handful of primitives in ordinary Boolean logic. Another one of those books (like SICP and VCLADF and the Feynman lectures) that a high-schooler can understand but the average PhD would benefit from.

This is a very good introduction to temporal reasoning, with a language designed to encourage habits essential for describing large systems readably. The book will benefit both novice and expert readers, and also people that do not plan to specify systems themselves, but need to understand the process, so that they can communicate with those that will. The material is presented precisely in simple mathematics, introduced as needed. The writing is engaging, not at all boring nor boilerplate, which has been a challenge for many other authors.To convince yourself, you can start by reading the PDF version online, available by the author here: http://research.microsoft.com/en-us/um/people/lamport/tla/book.htmlCompared to the relevant papers by Lamport and coauthors, the book is geared more towards beginners and users. It is not a collection of all the results, but has a complementary purpose. In particular, composition of open systems and timing constraints are developed in more detail outside this book.

For a long time, I’ve been thinking about ways to improve the reliability of the software we write. We use many techniques to strive for this goal, sometimes in a roundabout way, but the ultimate approach would be mathematical proofs of correctness.Of the approaches I’ve read over the years, Lamport’s TLA+ comes the closest to this promise a system specification that’s workable. This book provides a great introduction with practical, real-world examples.

How is it possible that nobody has reviewed this book yet?This has been an eye opener book for concurrency and distributed software design. I learned more with this book (and the TLA+ toolbox) than with the "classic" from Lynch on distributed algorithms. I do not know if Lynch book also improves qualitatively when used with the Tempo toolbox. I guess it is worth trying.The book is challenging but it is really well-written. I’ll recommend the book to anyone that wants to challenge his understanding of computer systems (hardware, software, concurrency, etc). You will never evaluate your designs so naively.I would like to have a new edition of this book that covers TLA+2.BTW, You can get the pdf from Lamport web page.

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