

## 2. Specification Abstraction

- Control program should express desired behavior
- It should not be responsible for implementing that behavior on physical network infrastructure
- Natural abstraction: **simplified model** of network
  - Simple model with only enough detail to specify goals
- Requires a new shared control layer:
  - **Map abstract configuration to physical configuration**
- This is “network virtualization”

# Abstraction Specification In Program

**Barbara Liskov, John Guttag**



## **Abstraction Specification In Program:**

**Abstraction and Specification in Program Development** Barbara Liskov, John Guttag, 1986 Abstraction and Specification in Program Development offers professionals in program design and software engineering a methodology that will enable them to construct programs that are reliable and reasonably easy to understand modify and maintain Good programming involves the systematic mastery of complexity and this book provides the first unified treatment of the techniques of abstraction and specification which the authors argue are the linchpin of any effective approach to programming They place particular emphasis on the use of data abstraction to produce highly modular programs The authors focus on the process of decomposing large program projects into independent modules that can be assigned to independent working groups They discuss methods of decomposition the kinds of modules that are most useful in this process and techniques to increase the likelihood that modules produced can in fact be recombined to solve the original programming problem There are many examples of abstractions throughout the text and each chapter ends with pertinent references and exercises Most of the sample implementations in the book are written in CLU one of a growing number of languages able to support data abstraction Sufficient material is included however to allow the reader to work in Pascal as well The material in this book was developed by the authors during a decade of teaching undergraduate graduate and professional level courses Barbara Liskov the developer of CLU is Professor and John Guttag an Associate Professor of Computer Science at MIT Abstraction and Specification in Program Development is included in the MIT Electrical Engineering and Computer Science series

**Program Development in Java** Barbara Liskov, John Guttag, 2000-06-06 Written by a world renowned expert on programming methodology and the winner of the 2008 Turing Award this book shows how to build production quality programs programs that are reliable easy to maintain and quick to modify Its emphasis is on modular program construction how to get the modules right and how to organize a program as a collection of modules The book presents a methodology effective for either an individual programmer who may be writing a small program or a single module in a larger one or a software engineer who may be part of a team developing a complex program comprised of many modules Both audiences will acquire a solid foundation for object oriented program design and component based software development from this methodology Because each module in a program corresponds to an abstraction such as a collection of documents or a routine to search the collection for documents of interest the book first explains the kinds of abstractions most useful to programmers procedures iteration abstractions and most critically data abstractions Indeed the author treats data abstraction as the central paradigm in object oriented program design and implementation The author also shows with numerous examples how to develop informal specifications that define these abstractions specifications that describe what the modules do and then discusses how to implement the modules so that they do what they are supposed to do with acceptable performance Other topics discussed include Encapsulation and the need for an implementation to provide the

behavior defined by the specification Tradeoffs between simplicity and performance Techniques to help readers of code understand and reason about it focusing on such properties as rep invariants and abstraction functions Type hierarchy and its use in defining families of related data abstractions Debugging testing and requirements analysis Program design as a top down iterative process and design patterns The Java programming language is used for the book s examples However the techniques presented are language independent and an introduction to key Java concepts is included for programmers who may not be familiar with the language

**Bibliography on Abstract Data Types** B. Kutzler,F. Lichtenberger,2012-12-06 Sponsored by the sterr Fonds zur F rderung der Wissenschaftlichen Forschung project nr P4567 The Programming and Proof System ATES Armand Puccetti,2013-11-11 Today people use a large number of systems ranging in complexity from washing machines to international airline reservation systems Computers are used in nearly all such systems accuracy and security are becoming increasingly essential The design of such computer systems should make use of development methods as systematic as those used in other engineering disciplines A systematic development method must provide a way of writing specifications which are both precise and concise it must also supply a way of relating design to specification A concise specification can be achieved by restricting attention to what a system has to do all considerations of implementation details are postponed With computer systems this is done by 1 building an abstract model of the system operations being specified by pre and post conditions 2 defining languages by mapping program texts onto some collection of objects modelizing the concepts of the system to be dealt with whose meaning is understood 3 defining complex data objects in terms of abstractions known from mathematics This last topic the use of abstract data types pervades all work on specifications and is necessary in order to apply ideas to systems of significant complexity The use of mathematics based notations is the best way to achieve precision 1 1 ABSTRACT DATA TYPES PROOF TECHNIQUES From a practical point of view a solution to these three problems consists to introduce abstract data types in the programming languages and to consider formal proof methods

**The Software Life Cycle** Darrel Ince,Derek Andrews,2014-05-20 The Software Life Cycle deals with the software lifecycle that is what exactly happens when software is developed Topics covered include aspects of software engineering structured techniques of software development and software project management The use of mathematics to design and develop computer systems is also discussed This book is comprised of 20 chapters divided into four sections and begins with an overview of software engineering and software development paying particular attention to the birth of software engineering and the introduction of formal methods of software development The next section explores some aspects of software engineering that tend to get ignored in the literature including functional programming functional programming languages and relational databases The reader is then introduced to structured methods of software development along with software project management The final chapter is devoted to software testing which can be functional or nonfunctional This monograph will be useful to software engineers and designers Fourth International

Workshop on Software Specification and Design ,1987

**and Object-Oriented Design** B. Liskov,Guttag,2000

Weishi Zhang,1996

**Software Maintenance - A Management Perspective** Phaneendra Nath Vellanky,2007-10-23

Formal Description and Development of Graphical User Interfaces

Computer systems play an important role in our society Software drives those systems Massive investments of time and resources are made in developing and implementing these systems Maintenance is inevitable It is hard and costly Considerable resources are required to keep the systems active and dependable We cannot maintain software unless maintainability characters are built into the products and processes There is an urgent need to reinforce software development practices based on quality and reliability principles Though maintenance is a mini development lifecycle it has its own problems Maintenance issues need corresponding tools and techniques to address them Software professionals are key players in maintenance While development is an art and science maintenance is a craft We need to develop maintenance personnel to master this craft Technology impact is very high in systems world today We can no longer conduct business in the way we did before That calls for reengineering systems and software Even reengineered software needs maintenance soon after its implementation We have to take business knowledge procedures and data into the newly reengineered world Software maintenance people can play an important role in this migration process Software technology is moving into global and distributed networking environments Client server systems and object orientation are on their way Massively parallel processing systems and networking resources are changing database services into corporate data warehouses Software engineering environments rapid application development tools are changing the way we used to develop and maintain software Software maintenance is moving from code maintenance to design maintenance even onto specification maintenance Modifications today are made at specification level regenerating the software components testing and integrating them with the system Eventually software maintenance has to manage the evolution and evolutionary characteristics of software systems Software professionals have to maintain not only the software but the momentum of change in systems and software In this study we observe various issues tools and techniques and the emerging trends in software technology with particular reference to maintenance We are not searching for specific solutions We are identifying issues and finding ways to manage them live with them and control their negative impact Formal Methods of Program Verification and Specification

Helmut K. Berg,1982

**The Evolution of Programs** DERSHOWITZ,2013-03-14 Ecclesiastes 12 12 Programs are

invariably subjected to many forms or transformation After an initial version of a program has been designed and developed it undergoes debugging and certification In addition most long lived programs have a life cycle that includes modifications to meet amended specifications and extensions for expanded capabilities Such evolution any aspects of programming are the topic of this monograph We present formal methods for manipulating programs and illustrate their application with numerous examples Such methods could be incorporated in semi automated programming environments where they would

serve to ease the burden on the programmer We begin by describing a method whereby a given program that achieves one goal can be modified to achieve a different goal or a program that computes wrong results can be debugged to achieve the intended results The abstraction of a set of cognate programs to obtain a program schema and the instantiation of abstract schemata to solve concrete problems are approached from the same perspective In addition we describe synthesis rules for generating code from specifications and annotation rules for making assertions about code The synthesis rules may be used when a program is first being developed or when in the course of modifying a program the need arises to rewrite a program segment Annotation rules may be used for the purpose of determining what an incorrect program really does before attempting to debug it or how a correct program works before attempting to modify it

Formal Specification and Software Development Dines Bjørner, Cliff B. Jones, 1982 Formal specification meta language VDM and programming languages VDM and other systems

**Software Specification Techniques** Narain Gehani, Andrew D. McGettrick, 1986

ADVANCED GEOGRAPHIC INFORMATION SYSTEMS -Volume II, 2009-09-19 Advanced Geographic Information Systems is a component of Encyclopedia of Earth and Atmospheric Sciences in the global Encyclopedia of Life Support Systems EOLSS which is an integrated compendium of twenty one Encyclopedias The content of the Theme on Advanced Geographic Information Systems is organized with state of the art presentations covering the following aspects of the subject Spatio Temporal Information Systems Interacting with GIS From Paper Cartography to Virtual Environments Spatial Data Management Topic Overview Introduction to Spatial Decision Support Systems GIS Interoperability from Problems to Solutions These volumes are aimed at the following five major target audiences University and College students Educators Professional practitioners Research personnel and Policy analysts managers and decision makers and NGOs

*Third International Workshop on Software Specification and Design*, 1985

Introducing Specification Using Z Bryan Ratcliff, 1994 Offering an introduction to formal specification using the Z notation this practical text makes use of a series of case studies of varying complexity to illustrate the construction of good specifications in Z These case studies serve to describe the most frequently used features of Z the relevant discrete mathematics and the various techniques used The text also includes an introduction to specification validation theorem proving and refinement The importance of formal methods within software engineering is stressed throughout and there are a large number of exercises with solutions

**Protocol Specification, Testing, and Verification, VII** IFIP Working Group 6.1, 1987

COMPASS ..., 1994

ACM Transactions on Software Engineering and Methodology, 2005

*Software Specification* John D. Gannon, James Purtilo, Marvin V. Zelkowitz, 1994 Based on material used by the authors in their teaching this volume provides a detailed comparison and study of the various methods for reasoning about software The material offers a comprehensive understanding of which program structures are easier to manipulate by formal techniques thus allowing professionals to write programs that are easier to reason about informally The basic technology presented should be of use in all programming environments

## **Abstraction Specification In Program** Book Review: Unveiling the Magic of Language

In a digital era where connections and knowledge reign supreme, the enchanting power of language has been apparent than ever. Its capability to stir emotions, provoke thought, and instigate transformation is truly remarkable. This extraordinary book, aptly titled "**Abstraction Specification In Program**," published by a very acclaimed author, immerses readers in a captivating exploration of the significance of language and its profound impact on our existence. Throughout this critique, we will delve into the book's central themes, evaluate its unique writing style, and assess its overall influence on its readership.

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### **Table of Contents Abstraction Specification In Program**

1. Understanding the eBook Abstraction Specification In Program
  - The Rise of Digital Reading Abstraction Specification In Program
  - Advantages of eBooks Over Traditional Books
2. Identifying Abstraction Specification In Program
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an Abstraction Specification In Program
  - User-Friendly Interface
4. Exploring eBook Recommendations from Abstraction Specification In Program
  - Personalized Recommendations
  - Abstraction Specification In Program User Reviews and Ratings
  - Abstraction Specification In Program and Bestseller Lists
5. Accessing Abstraction Specification In Program Free and Paid eBooks

- Abstraction Specification In Program Public Domain eBooks
- Abstraction Specification In Program eBook Subscription Services
- Abstraction Specification In Program Budget-Friendly Options
- 6. Navigating Abstraction Specification In Program eBook Formats
  - ePub, PDF, MOBI, and More
  - Abstraction Specification In Program Compatibility with Devices
  - Abstraction Specification In Program Enhanced eBook Features
- 7. Enhancing Your Reading Experience
  - Adjustable Fonts and Text Sizes of Abstraction Specification In Program
  - Highlighting and Note-Taking Abstraction Specification In Program
  - Interactive Elements Abstraction Specification In Program
- 8. Staying Engaged with Abstraction Specification In Program
  - Joining Online Reading Communities
  - Participating in Virtual Book Clubs
  - Following Authors and Publishers Abstraction Specification In Program
- 9. Balancing eBooks and Physical Books Abstraction Specification In Program
  - Benefits of a Digital Library
  - Creating a Diverse Reading Collection Abstraction Specification In Program
- 10. Overcoming Reading Challenges
  - Dealing with Digital Eye Strain
  - Minimizing Distractions
  - Managing Screen Time
- 11. Cultivating a Reading Routine Abstraction Specification In Program
  - Setting Reading Goals Abstraction Specification In Program
  - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Abstraction Specification In Program
  - Fact-Checking eBook Content of Abstraction Specification In Program
  - Distinguishing Credible Sources
- 13. Promoting Lifelong Learning
  - Utilizing eBooks for Skill Development

- 
- Exploring Educational eBooks
14. Embracing eBook Trends
- Integration of Multimedia Elements
  - Interactive and Gamified eBooks

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