

# Distributed Systems Tanenbaum Solution

The Internet of Things describes a world in which smart technologies enable objects with a network to communicate with each other and interface with humans effortlessly. This connected world of convenience and technology does not come without its drawbacks, as interconnectivity implies hackability. Security Solutions for Hyperconnectivity and the Internet of Things offers insights from cutting-edge research about the strategies and techniques that can be implemented to protect against cyber-attacks. Calling for revolutionary protection strategies to reassess security, this book is an essential resource for programmers, engineers, business professionals, researchers, and advanced students in relevant fields.

Some previous editions of this book were published from Pearson Education (ISBN 9788131730225). This book, designed for those who are taking introductory courses on operating systems, presents both theoretical and practical aspects of modern operating systems. Although the emphasis is on theory, while exposing you (the reader) the subject matter, this book maintains a balance between theory and practice. The theories and technologies that have fueled the evolution of operating systems are primarily geared towards two goals: user convenience in maneuvering computers and efficient utilization of hardware resources. This book also discusses many fundamental concepts that have been formulated over the past several decades and that continue to be used in many modern operating systems. In addition, this book also discusses those technologies that prevail in many modern operating systems such as UNIX, Solaris, Linux, and Windows. While the former two have been used to

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present many in-text examples, the latter two are dealt with as separate technological case studies. They highlight the various issues in the design and development of operating systems and help you correlate theories to technologies. This book also discusses Android exposing you a modern software platform for embedded devices. This book supersedes ISBN 9788131730225 and its other derivatives, from Pearson Education India. (They have been used as textbooks in many schools worldwide.) You will definitely love this self edition, and you can use this as a textbook in undergraduate-level operating systems courses.

Discusses the main issues, challenges, opportunities, and trends related to this explosive range of new developments and applications, in constant evolution, and impacting every organization and society as a whole. This two volume handbook supports post-graduate students, teachers, and researchers, as well as IT professionals and managers.

"Today's society can no longer function without information technology. Essential infrastructure including the transportation system, banking, the entertainment industry, the health care system, government, the military and the education system can no longer survive without modern technology. This increasing dependence on information technology creates new opportunities for the benefit of society. However, it also opens an avenue that can be exploited for illicit purposes. The stakes are high and many attacks go undetected or unreported. In addition to losses such as data or other forms of intellectual property, financial theft or the shut down of infrastructure, computer security attacks that target critical infrastructure such as nuclear power plants has the potential to cause human casualties on a massive and unprecedented scale. This book provides a discussion on a wide variety of viewpoints on some of the main challenges facing secure systems. This book will

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therefore be of major interest to all researchers in academia or industry with an interest in computer security. It is also relevant to graduate and advanced level undergraduate students who may want to explore the latest developments in the area of computer and information security."

Electrical energy usage is increasing every year due to population growth and new forms of consumption. As such, it is increasingly imperative to research methods of energy control and safe use. Security Solutions and Applied Cryptography in Smart Grid Communications is a pivotal reference source for the latest research on the development of smart grid technology and best practices of utilization. Featuring extensive coverage across a range of relevant perspectives and topics, such as threat detection, authentication, and intrusion detection, this book is ideally designed for academicians, researchers, engineers and students seeking current research on ways in which to implement smart grid platforms all over the globe.

Both authors have taught the course of "Distributed Systems" for many years in the respective schools. During the teaching, we feel strongly that "Distributed systems" have evolved from traditional "LAN" based distributed systems towards "Internet based" systems. Although there exist many excellent textbooks on this topic, because of the fast development of distributed systems and network programming/protocols, we have difficulty in finding an appropriate textbook for the course of "distributed systems" with orientation to the requirement of the undergraduate level study for today's distributed technology. Specifically, from - to-date concepts, algorithms, and models to implementations for both distributed system designs and application programming. Thus the philosophy behind this book is to integrate the concepts, algorithm designs and implementations of distributed systems based on network

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programming. After using several materials of other textbooks and research books, we found that many texts treat the distributed systems with separation of concepts, algorithm design and network programming and it is very difficult for students to map the concepts of distributed systems to the algorithm design, prototyping and implementations. This book intends to enable readers, especially postgraduates and senior undergraduate level, to study up-to-date concepts, algorithms and network programming skills for building modern distributed systems. It enables students not only to master the concepts of distributed network system but also to readily use the material introduced into implementation practices.

A lucid and up-to-date introduction to the fundamentals of distributed computing systems As distributed systems become increasingly available, the need for a fundamental discussion of the subject has grown. Designed for first-year graduate students and advanced undergraduates as well as practicing computer engineers seeking a solid grounding in the subject, this well-organized text covers the fundamental concepts in distributed computing systems such as time, state, simultaneity, order, knowledge, failure, and agreement in distributed systems. Departing from the focus on shared memory and synchronous systems commonly taken by other texts, this is the first useful reference based on an asynchronous model of distributed computing, the most widely used in academia and industry. The emphasis of the book is on developing general mechanisms that can be applied to a variety of problems. Its examples-clocks, locks, cameras, sensors, controllers, slicers, and synchronizers-have been carefully chosen so that they are fundamental and yet useful in practical contexts. The text's advantages include: Emphasizes general mechanisms that can be applied to a variety of problems Uses a simple induction-based technique

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to prove correctness of all algorithms Includes a variety of exercises at the end of each chapter Contains material that has been extensively class tested Gives instructor flexibility in choosing appropriate balance between practice and theory of distributed computing

Industries and particularly the manufacturing sector have been facing difficult challenges in a context of socio-economic turbulence characterized by complexity as well as the speed of change in causal interconnections in the socio-economic environment. In order to respond to these challenges companies are forced to seek new technological and organizational solutions. In this context two main characteristics emerge as key properties of a modern automation system – agility and distribution. Agility because systems need not only to be flexible in order to adjust to a number of a-priori defined scenarios, but rather must cope with unpredictability. Distribution in the sense that automation and business processes are becoming distributed and supported by collaborative networks. Emerging Solutions for Future Manufacturing Systems includes the papers selected for the BASYS'04 conference, which was held in Vienna, Austria in September 2004 and sponsored by the International Federation for Information Processing (IFIP). Beyond Bitcoin and the world of cryptocurrencies, blockchain is an extraordinary technology that is revealing a surprising transformative power impacting all the industries. Blockchain requires a paradigm shift toward disintermediation and antifragility, which is today even more necessary for business and society. In this book, the reader will find a representation of the entire blockchain ecosystem from a pragmatic point of view that encompasses actual cases of organizations, companies, and communities that are already working hard to realize it. To understand an ecosystem so mutable and fragmented and not get lost in its complexity, it is essential to

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focus on the most crucial factor: the impact that these technologies can have on our lives in all the world. A new financial platform, a new way of distributing goods, a new approach to social media, a new market for fine art, a new kinds of governance (yes, also political) are some of the domains impacted by the blockchain that the book analyzes. This revolution is not happening only in Silicon Valley but in multiple hubs around the world, including New York, Zug, Shanghai, London, Hong Kong, Dubai, Singapore, Tallin, and more. Moreover, the Author covers the impact of blockchain on the world of work both for traditional companies that seek to incorporate the new technology in their business model and for native blockchain organizations and communities, which are driving the technology towards mass adoption. The new edition of this bestselling title on Distributed Systems has been thoroughly revised throughout to reflect the state of the art in this rapidly developing field. It emphasizes the principles used in the design and construction of distributed computer systems based on networks of workstations and server computers.

This unique textbook/reference presents unified coverage of bioinformatics topics relating to both biological sequences and biological networks, providing an in-depth analysis of cutting-edge distributed algorithms, as well as of relevant sequential algorithms. In addition to introducing the latest algorithms in this area, more than fifteen new distributed algorithms are also proposed. Topics and features: reviews a range of open challenges in biological sequences and networks; describes in detail both sequential and parallel/distributed algorithms for each problem; suggests approaches for distributed algorithms as possible extensions to sequential algorithms, when the distributed algorithms for the topic are scarce; proposes a number of new distributed algorithms in each chapter, to serve as potential starting

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points for further research; concludes each chapter with self-test exercises, a summary of the key points, a comparison of the algorithms described, and a literature review.

Distributed systems employed in critical infrastructures must fulfill dependability, timeliness, and performance specifications. Since these systems most often operate in an unpredictable environment, their design and maintenance require quantitative evaluation of deterministic and probabilistic timed models. This need gave birth to an abundant literature devoted to formal modeling languages combined with analytical and simulative solution techniques. The aim of the book is to provide an overview of techniques and methodologies dealing with such specific issues in the context of distributed systems and covering aspects such as performance evaluation, reliability/availability, energy efficiency, scalability, and sustainability. Specifically, techniques for checking and verifying if and how a distributed system satisfies the requirements, as well as how to properly evaluate non-functional aspects, or how to optimize the overall behavior of the system, are all discussed in the book. The scope has been selected to provide a thorough coverage on issues, models, and techniques relating to validation, evaluation and optimization of distributed systems. The key objective of this book is to help to bridge the gaps between modeling theory and the practice in distributed systems through specific examples.

Recent years have seen remarkable progress on both advanced multimedia data processing and intelligent network information systems. The objective of this book is to contribute to the development of multimedia processing and the intelligent information systems and to provide the researchers with the essentials of current knowledge, experience and know-how. Although many aspects of such systems have already been under investigation, but there are

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many new that wait to be discovered and defined. The book contains a selection of 36 papers based on original research presented during the 10th International Conference on Multimedia & Network Information Systems (MISSI 2016) held on 14–16 September 2016 in Wrocław, Poland. The papers provide an overview the achievements of researchers from several countries in three continents. The volume is divided into five parts: (a) Images and Videos - Virtual and Augmented Reality, (b) Voice Interactions in Multimedia Systems, (c) Tools and Applications, (d) Natural Language in Information Systems, and (e) Internet and Network Technologies. The book is an excellent resource for researchers, those working in multimedia, Internet, and Natural Language technologies, as well as for students interested in computer science and other related fields. Many applications follow the distributed computing paradigm, in which parts of the application are executed on different network-interconnected computers. The extension of these applications in terms of number of users or size has led to an unprecedented increase in the scale of the infrastructure that supports them. Large-Scale Distributed Computing and Applications: Models and Trends offers a coherent and realistic image of today's research results in large scale distributed systems, explains state-of-the-art technological solutions for the main issues regarding large scale distributed systems, and presents the benefits of using large scale distributed systems and the development process of scientific and commercial distributed applications.

This second edition of Distributed Systems, Principles & Paradigms, covers the principles, advanced concepts, and technologies of distributed systems in detail, including: communication, replication, fault tolerance, and security. Intended for use in a senior/graduate level distributed systems course or by professionals, this text systematically



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shows how distributed systems are designed and implemented in real systems.

USM 2000 is the third event in a series of international IFIP/GI conferences on Trends in Distributed Systems. Following the venues in Aachen, Germany (1996) and Hamburg, Germany (1998), this event in Munich considers the trend towards a Universal Service Market – USM 2000. The trend towards a universal service market has many origins, e.g., the integration of telecom and data communications, the deregulation efforts with respect to telco markets, the globalization of information, the virtualization of companies, the requirement of a short time-to-market, the advances in network technologies, the increasing acceptance of e-commerce, and the increase in mobility. This leads to new business-to-business (B2B) and business-to-customer (B2C) environments that offer both challenges and opportunities to enterprises and end-users. There is the need for ubiquitous services, trading, brokering and information management, for service market and business models, and for flexible infrastructures for dynamic collaboration. Researchers, service vendors, and users must cooperate to set up the appropriate requirements for a universal service market and to find solutions with respect to supporting platforms, middleware, distributed applications, and management. The basis for these solutions is a common understanding of means for defining, creating, implementing, and deploying the service market. Then, service market makers, service aggregators, service auctioneers, ISP, ASP, BPO, and customers can freely interact in a dynamic, open, and universal market place. The field of Knowledge and Systems Engineering (KSE) has experienced rapid development and inspired many applications in the world of information technology during the last decade. The KSE conference aims at providing an open international forum for presentation, discussion and exchange

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of the latest advances and challenges in research of the field. These proceedings contain papers presented at the Fifth International Conference on Knowledge and Systems Engineering (KSE 2013), which was held in Hanoi, Vietnam, during 17–19 October, 2013. Besides the main track of contributed papers, which are compiled into the first volume, the conference also featured several special sessions focusing on specific topics of interest as well as included one workshop, of which the papers form the second volume of these proceedings. The book gathers a total of 68 papers describing recent advances and development on various topics including knowledge discovery and data mining, natural language processing, expert systems, intelligent decision making, computational biology, computational modeling, optimization algorithms, and industrial applications.

For Introductory Courses in Operating Systems in Computer Science, Computer Engineering, and Electrical Engineering programs. The widely anticipated revision of this worldwide best-seller incorporates the latest developments in operating systems (OS) technologies. The Third Edition includes up-to-date materials on relevant OS such as Linux, Windows, and embedded real-time and multimedia systems. Tanenbaum also provides information on current research based on his experience as an operating systems researcher.

This book presents 15 tutorial lectures by leading researchers given at the 11th edition of the International School on Formal Methods for the Design of Computer, Communication and Software Systems, SFM 2011, held in Bertinoro, Italy, in June 2011. SFM 2011 was devoted to formal methods for eternal networked software systems and covered several topics including formal foundations for the inter-operability of software systems, application-layer and middleware-layer dynamic connector synthesis, interaction behavior monitoring and learning, and quality assurance of connected systems.

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The school was held in collaboration with the researchers of the EU-funded projects CONNECT and ETERNALS. The papers are organized into six parts: (i) architecture and interoperability, (ii) formal foundations for connectors, (iii) connector synthesis, (iv) learning and monitoring, (v) dependability assurance, and (vi) trustworthy eternal systems via evolving software.

Welcome to Middleware'98 and to one of England's most beautiful regions. In recent years the distributed systems community has witnessed a growth in the number of conferences, leading to difficulties in tracking the literature and a consequent loss of awareness of work done by others in this important field. The aim of Middleware'98 is to synthesise many of the smaller workshops and conferences in this area, bringing together research communities which were becoming fragmented. The conference has been designed to maximise the experience for attendees. This is reflected in the choice of a resort venue (rather than a big city) to ensure a strong focus on interaction with other distributed systems researchers. The programme format incorporates a question-and-answer panel in each session, enabling significant issues to be discussed in the context of related papers and presentations. The invited speakers and tutorials are intended to not only inform the attendees, but also to stimulate discussion and debate.

Mobile and Handheld Computing Solutions for Organizations and End-Users discusses a broad range of topics in order to advance handheld knowledge and apply the proposed methods to real-world issues for organizations and end users. This book brings together researchers and practitioners involved with mobile and handheld computing solutions useful for IT students, researchers, and scholars.

For this third edition of -Distributed Systems, - the material has been thoroughly revised and extended, integrating

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principles and paradigms into nine chapters: 1. Introduction 2. Architectures 3. Processes 4. Communication 5. Naming 6. Coordination 7. Replication 8. Fault tolerance 9. Security A separation has been made between basic material and more specific subjects. The latter have been organized into boxed sections, which may be skipped on first reading. To assist in understanding the more algorithmic parts, example programs in Python have been included. The examples in the book leave out many details for readability, but the complete code is available through the book's Website, hosted at [www.distributed-systems.net](http://www.distributed-systems.net). A personalized digital copy of the book is available for free, as well as a printed version through Amazon.com.

This book will provide answers to the most common questions that face enterprise leaders concerning service oriented architecture development lifecycle initiatives. It is a guide for service-oriented projects. The tentative chapters are: (1) Introduction to Service Modeling; (2) Service Polymorphism; (3) Service Typing and Service Structure Model; (4) Service Development Lifecycle Model; (5) Service Conceptualization; (6) Service Discovery and Analysis; (7) Business Service Architecture; (8) Service Design and Realization; (9) Service Architecture Conceptualization; (10) Service Architecture Modeling.

Explains fault tolerance in clear terms, with concrete examples drawn from real-world settings Highly practical focus aimed at building "mission-critical" networked applications that remain secure

Cyber security has become a topic of concern over the past decade as private industry, public administration, commerce, and communication have gained a greater online presence. As many individual and organizational activities continue to evolve in the digital sphere, new vulnerabilities arise. Cyber Security and Threats: Concepts, Methodologies, Tools, and

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Applications contains a compendium of the latest academic material on new methodologies and applications in the areas of digital security and threats. Including innovative studies on cloud security, online threat protection, and cryptography, this multi-volume book is an ideal source for IT specialists, administrators, researchers, and students interested in uncovering new ways to thwart cyber breaches and protect sensitive digital information.

This third edition of a classic textbook can be used to teach at the senior undergraduate and graduate levels. The material concentrates on fundamental theories as well as techniques and algorithms. The advent of the Internet and the World Wide Web, and, more recently, the emergence of cloud computing and streaming data applications, has forced a renewal of interest in distributed and parallel data management, while, at the same time, requiring a rethinking of some of the traditional techniques. This book covers the breadth and depth of this re-emerging field. The coverage consists of two parts. The first part discusses the fundamental principles of distributed data management and includes distribution design, data integration, distributed query processing and optimization, distributed transaction management, and replication. The second part focuses on more advanced topics and includes discussion of parallel database systems, distributed object management, peer-to-peer data management, web data management, data stream systems, and cloud computing. New in this Edition: • New chapters, covering database replication, database integration, multidatabase query processing, peer-to-peer data management, and web data management. • Coverage of emerging topics such as data streams and cloud computing • Extensive revisions and updates based on years of class testing and feedback Ancillary teaching materials are available.

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\* Comprehensive introduction to the fundamental results in the mathematical foundations of distributed computing \* Accompanied by supporting material, such as lecture notes and solutions for selected exercises \* Each chapter ends with bibliographical notes and a set of exercises \* Covers the fundamental models, issues and techniques, and features some of the more advanced topics

Blockchain technology is an emerging distributed, decentralized architecture and computing paradigm, which has accelerated the development and application of cloud, fog and edge computing; artificial intelligence; cyber physical systems; social networking; crowdsourcing and crowdsensing; 5g; trust management and finance; and other many useful sectors. Nowadays, the primary blockchain technology uses are in information systems to keep information secure and private. However, many threats and vulnerabilities are facing blockchain in the past decade such 51% attacks, double spending attacks, etc. The popularity and rapid development of blockchain brings many technical and regulatory challenges for research and academic communities. The main goal of this book is to encourage both researchers and practitioners of Blockchain technology to share and exchange their experiences and recent studies between academia and industry. The reader will be provided with the most up-to-date knowledge of blockchain in mainstream areas of security and privacy in the decentralized domain, which is timely and essential (this is due to the fact that the distributed and p2p applications are increasing day-by-day, and the attackers adopt new mechanisms to threaten the security and privacy of the users in those environments). This book provides a detailed explanation of security and privacy with respect to blockchain for information systems, and will be an essential resource for students, researchers and scientists studying blockchain uses in information

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systems and those wanting to explore the current state of play.

This book constitutes the refereed proceedings of the ACM/IFIP/USENIX 12th International Middleware Conference, held in Lisbon, Portugal, in December 2011. The 22 revised full papers presented together with 2 industry papers and an invited paper were carefully reviewed and selected from 125 submissions. The papers are organized in topical sections on social networks, storage and performance management, green computing and resource management, notification and streaming, replication and caching, security and interoperability, and run-time (re)configuration and inspection.

Distributed Systems: An Algorithmic Approach, Second Edition provides a balanced and straightforward treatment of the underlying theory and practical applications of distributed computing. As in the previous version, the language is kept as unobscured as possible—clarity is given priority over mathematical formalism. This easily digestible text: Features significant updates that mirror the phenomenal growth of distributed systems Explores new topics related to peer-to-peer and social networks Includes fresh exercises, examples, and case studies Supplying a solid understanding of the key principles of distributed computing and their relationship to real-world applications, Distributed Systems: An Algorithmic Approach, Second Edition makes both an ideal textbook and a handy professional reference.

How to solve security issues and problems arising in distributed systems. Security is one of the leading concerns in developing dependable distributed systems of today, since the integration of different components in a distributed manner creates new security problems and issues. Service oriented architectures, the Web, grid computing and virtualization – form the backbone of today's distributed



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systems. A lens to security issues in distributed systems is best provided via deeper exploration of security concerns and solutions in these technologies. Distributed Systems Security provides a holistic insight into current security issues, processes, and solutions, and maps out future directions in the context of today's distributed systems. This insight is elucidated by modeling of modern day distributed systems using a four-tier logical model –host layer, infrastructure layer, application layer, and service layer (bottom to top). The authors provide an in-depth coverage of security threats and issues across these tiers. Additionally the authors describe the approaches required for efficient security engineering, alongside exploring how existing solutions can be leveraged or enhanced to proactively meet the dynamic needs of security for the next-generation distributed systems. The practical issues thereof are reinforced via practical case studies. Distributed Systems Security: Presents an overview of distributed systems security issues, including threats, trends, standards and solutions. Discusses threats and vulnerabilities in different layers namely the host, infrastructure, application, and service layer to provide a holistic and practical, contemporary view of enterprise architectures. Provides practical insights into developing current-day distributed systems security using realistic case studies. This book will be of invaluable interest to software engineers, developers, network professionals and technical/enterprise architects working in the field of distributed systems security. Managers and CIOs, researchers and advanced students will also find this book insightful.

Introduction : distributed systems - The model -  
Communication protocols - Routing algorithms - Deadlock-free packet switching - Wave and traversal algorithms -  
Election algorithms - Termination detection - Anonymous



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networks - Snapshots - Sense of direction and orientation - Synchrony in networks - Fault tolerance in distributed systems - Fault tolerance in asynchronous systems - Fault tolerance in synchronous systems - Failure detection - Stabilization.

This book reflects the scientific program of the annual workshop on Graph-theoretic Concepts in Computer Science in 1987. The purpose of this conference is to be the "missing link" between theory and application of graphs in as many branches of computer science as a conference scheduled for three days without parallel sessions can permit. So the organizers of WG '87 addressed a selected group of people with a strong interest in theory and practice. The proceedings include latest results on "classical" graph-theoretic problems (including formal language theory applied to graphs) and how to apply those results to practical problems, e.g. data bases, layout of graph operating systems, software engineering, chemistry, and modelling with graphs.

Biomedical Diagnostics and Clinical Technologies: Applying High-Performance Cluster and Grid Computing disseminates knowledge regarding high performance computing for medical applications and bioinformatics. This critical reference source contains a valuable collection of cutting-edge research chapters for those working in the broad field of medical informatics and bioinformatics.

No further information has been provided for this title. Designing distributed computing systems is a complex process requiring a solid understanding of the design problems and the theoretical and practical aspects of

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their solutions. This comprehensive textbook covers the fundamental principles and models underlying the theory, algorithms and systems aspects of distributed computing. Broad and detailed coverage of the theory is balanced with practical systems-related issues such as mutual exclusion, deadlock detection, authentication, and failure recovery. Algorithms are carefully selected, lucidly presented, and described without complex proofs. Simple explanations and illustrations are used to elucidate the algorithms. Important emerging topics such as peer-to-peer networks and network security are also considered. With vital algorithms, numerous illustrations, examples and homework problems, this textbook is suitable for advanced undergraduate and graduate students of electrical and computer engineering and computer science. Practitioners in data networking and sensor networks will also find this a valuable resource. Additional resources are available online at [www.cambridge.org/9780521876346](http://www.cambridge.org/9780521876346).

"This volume offers intriguing applications, reviews and additions to the methodology of intelligent computing, presenting the emerging trends of state-of-the-art intelligent systems and their practical applications"--Provided by publisher.

This book constitutes the refereed proceedings of the 8th International Symposium on Stabilization, Safety, and Security of Distributed Systems, SSS 2006, held in Dallas, TX, USA in November 2006. The 36 revised full papers and 12 revised short papers presented together with the extended abstracts of 2 invited lectures address all aspects of self-stabilization, safety and security,

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recovery oriented systems and programming.

Distributed Systems Principles and

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