

# Distributed Computing: Principles, Algorithms, and Systems

Distributed computing is a paradigm in which a computational task is divided into smaller subtasks that are executed on a network of computers. This approach has become increasingly popular in recent years due to the proliferation of powerful and inexpensive computers. Distributed computing offers a number of advantages over traditional centralized computing, including:

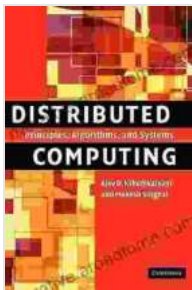
- **Scalability:** Distributed systems can be easily scaled up to handle larger workloads by adding more computers to the network.
- **Reliability:** Distributed systems are more reliable than centralized systems because if one computer fails, the other computers can continue to operate.
- **Efficiency:** Distributed systems can be more efficient than centralized systems because they can take advantage of the parallelism inherent in a network of computers.

There are a number of principles that are essential to the design and implementation of distributed systems. These principles include:

- **Transparency:** Distributed systems should be transparent to the user, meaning that the user should not be aware that the system is distributed.
- **Concurrency:** Distributed systems must be able to handle multiple requests concurrently.

- **Fault tolerance:** Distributed systems must be able to tolerate failures of individual computers.
- **Security:** Distributed systems must be secure from unauthorized access.

There are a number of algorithms that are used to solve common problems in distributed computing. These algorithms include:



## Distributed Computing: Principles, Algorithms, and Systems by Ajay D. Kshemkalyani

★★★★☆ 4.4 out of 5

Language	: English
File size	: 50724 KB
Text-to-Speech	: Enabled
Screen Reader	: Supported
Enhanced typesetting	: Enabled
Print length	: 758 pages



- **Consensus algorithms:** Consensus algorithms are used to ensure that all computers in a distributed system agree on a single value.
- **Load balancing algorithms:** Load balancing algorithms are used to distribute the workload evenly across all computers in a distributed system.
- **Scheduling algorithms:** Scheduling algorithms are used to determine which computer will execute a particular task.
- **Routing algorithms:** Routing algorithms are used to determine the best path for a message to travel through a network.

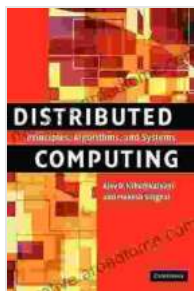
There are a number of systems that have been developed to support distributed computing. These systems include:

- **Middleware:** Middleware is software that provides a layer of abstraction between the application and the operating system. Middleware can be used to hide the details of the distributed system from the application developer.
- **Virtualization:** Virtualization is a technology that allows multiple operating systems to run on a single physical computer. Virtualization can be used to create a distributed system on a single computer.
- **Cloud computing:** Cloud computing is a model for delivering computing resources over the Internet. Cloud computing can be used to create distributed systems that are scalable and reliable.

Distributed computing is a powerful paradigm that can be used to solve a wide range of problems. The principles, algorithms, and systems that are used in distributed computing are essential to the design and implementation of successful distributed systems.

This book was written by George Coulouris, Jean Dollimore, and Tim Kindberg.

978-0131423143



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