

RRDtool vs TimescaleDB

A detailed comparison

Compare RRDtool and TimescaleDB for time series and OLAP workloads

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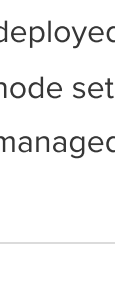
[Learn About Time Series Databases](#)

Choosing the right database is a critical choice when building any software application. All databases have different strengths and weaknesses when it comes to performance, so deciding which database has the most benefits and the most minor downsides for your specific use case and data model is an important decision. Below you will find an overview of the key concepts, architecture, features, use cases, and pricing models of RRDtool and TimescaleDB so you can quickly see how they compare against each other.

The primary purpose of this article is to compare how RRDtool and TimescaleDB perform for workloads involving [time series data](#), not for all possible use cases. Time series data typically presents a unique challenge in terms of database performance. This is due to the high volume of data being written and the query patterns to access that data. This article doesn't intend to make the case for which database is better; it simply provides an overview of each database so you can make an informed decision.

RRDtool vs TimescaleDB Breakdown





Database Model	RRDtool is a single-node, non-distributed database generally deployed on a single machine	Time Series Database
Architecture	RRDtool is a single-node, non-distributed database generally deployed on a single machine	TimescaleDB is built on top of PostgreSQL and inherits its architecture. It extends PostgreSQL with time-series-specific optimizations and functions, allowing it to manage time series data efficiently. It can be deployed as a single node, in a multi-node setup, or in the cloud as a managed service.
License	GNU GPLv2	Timescale License (for TimescaleDB Community Edition); Apache 2.0 (for core PostgreSQL)
Use Cases	Monitoring, observability, Network performance tracking, System metrics, Log data storage	Monitoring, observability, IoT, real-time analytics, financial market data
Scalability	Limited scalability- more suitable for small to medium-sized datasets	Horizontally scalable through native support for partitioning, replication, and sharding. Offers multi-node capabilities for distributing data and queries across nodes.

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RRDtool Overview

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RRDtool Overview

RRDtool, short for Round-Robin Database Tool, is an open-source, high-performance data logging and graphing system designed to handle time series data. Created by Tobias Oetiker in 1999, RRDtool is specifically built for storing and visualizing time-series data, such as network bandwidth, temperatures, or CPU load. Its primary feature is the efficient storage of data points, using a fixed-size database that automatically aggregates and archives older data points, ensuring that the database size remains constant over time.

TimescaleDB Overview

TimescaleDB is an open source time series database built on top of PostgreSQL. It was created to address the challenges of managing time series data, such as scalability, query performance, and data retention policies. TimescaleDB was first released in 2017 and has since become a popular choice for storing and analyzing time series data due to its PostgreSQL compatibility, performance optimizations, and flexible data retention policies.

RRDtool for Time Series Data

RRDtool was created for time series data storage and visualization, making it a great fit for applications that require efficient handling of this type of data. Its round-robin database structure ensures constant storage space usage while providing automatic data aggregation and archiving. However, RRDtool may not be suitable for applications that require complex queries or relational data storage, as its focus is primarily on time series data.

TimescaleDB for Time Series Data

TimescaleDB is specifically designed for time series data, making it a natural choice for storing and querying such data. It provides several advantages for time series data management like horizontal scalability, columnar storage, and retention policy support. However, TimescaleDB may not be the best choice for all time series use cases. One example would be if an application requires very high write throughput or real-time analytics, other specialized time series databases like InfluxDB may be more suitable.

RRDtool Key Concepts

- **Round-robin database:** A fixed-size database that stores time-series data using a circular buffer, overwriting older data as new data is added.
- **RRD file:** A single file that contains all the configuration and data for an RRDtool database.
- **Consolidation function:** A function that aggregates multiple data points into a single data point, such as AVERAGE, MIN, MAX, or LAST.

TimescaleDB Key Concepts

- **Hypertable:** A hypertable is a distributed table that is partitioned by time and possibly other dimensions, such as device ID or location. It is the primary abstraction for storing time series data in TimescaleDB and is designed to scale horizontally across multiple nodes.
- **Chunk:** A chunk is a partition of a hypertable, containing a subset of the hypertable's data. Chunks are created automatically by TimescaleDB based on a specified time interval and can be individually compressed, indexed, and backed up for better performance and data management.
- **Distributed Hypertables:** For large-scale deployments, TimescaleDB supports distributed hypertables, which partition data across multiple nodes for improved query performance and fault tolerance.

RRDtool Architecture

RRDtool is a specialized time series database that does not use SQL or a traditional relational data model. Instead, it employs a round-robin database structure, with data points stored in a fixed-size, circular buffer. RRDtool is a command-line tool that can be used to create and update RRD files, as well as generate graphs and reports from the stored data. It can be integrated with various scripting languages, such as Perl, Python, and Ruby, through available bindings.

TimescaleDB Architecture

TimescaleDB is an extension built on PostgreSQL, inheriting its relational data model and SQL support. However, TimescaleDB extends PostgreSQL with custom data structures and optimizations for time series data, such as hypertables and chunks.

Free Time-Series Database Guide

Get a comprehensive review of alternatives and critical requirements for selecting yours.

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RRDtool Features

Efficient Data Storage

RRDtool's round-robin database structure ensures constant storage space usage, automatically aggregating and archiving older data points.

Graphing

RRDtool provides powerful graphing capabilities, allowing users to generate customizable graphs and reports from the stored time series data.

Cross-Platform Support

RRDtool is available on various platforms, including Linux, Unix, macOS, and Windows.

TimescaleDB Features

Partitioning

TimescaleDB automatically partitions time series data tables using hypertables and chunks, which simplifies data management and improves query performance.

Time series focused SQL functions

TimescaleDB provides several specialized SQL functions and operators for time series data application scenarios, such as time_bucket, first, and last, which simplify querying and aggregating time series data.

Query optimization

As mentioned earlier, TimescaleDB extends PostgreSQL's query planner for writing and querying time series data, including optimizations like time-based indexing and chunk pruning.

RRDtool Use Cases

Network Monitoring

RRDtool is often used in network monitoring applications to store and visualize metrics such as bandwidth usage, latency, and packet loss.

Environmental Monitoring

RRDtool can be used to track and visualize environmental data, such as temperature, humidity, and air pressure, over time.

System Performance Monitoring

RRDtool is suitable for storing and displaying system performance metrics, like CPU usage, memory consumption, and disk I/O, for server and infrastructure monitoring.

TimescaleDB Use Cases

Monitoring and metrics

TimescaleDB is well-suited for storing and analyzing monitoring and metrics data, such as server performance metrics, application logs, and sensor data. Its hypertable structure and query optimizations make it easy to store, query, and visualize large volumes of time series data.

IoT data storage

TimescaleDB can be used to store and analyze IoT data, such as sensor readings and device status information. Its support for automatic partitioning and specialized SQL interfaces simplifies the management and querying of large-scale IoT datasets.

Financial data

TimescaleDB is suitable for storing and analyzing financial data, such as stock prices, exchange rates, and trading volumes. Its query optimizations and specialized SQL functions make it easy to perform time-based aggregations and analyze trends in financial data.

RRDtool Pricing Model

RRDtool is an open-source software, freely available for use under the GNU General Public License. Users can download, use, and modify the software at no cost. There are no commercial licensing options or paid support services offered directly by the project.

TimescaleDB Pricing Model

TimescaleDB is available in two editions: TimescaleDB Open Source and TimescaleDB Cloud. The open-source edition is free to use and can be self-hosted, while the cloud edition is a managed service with a pay-as-you-go pricing model based on storage, compute, and data transfer usage. TimescaleDB Cloud offers various pricing tiers with different levels of resources and features, such as continuous backups and high availability.

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