

Optimizing DHIS2 Performance: Monitoring, Metrics, and Recommendations for Enhanced Server Health

1. Understanding Monitoring in DHIS2

The primary focus is on assessing server health, identifying performance bottlenecks, and providing actionable recommendations to improve overall performance while preventing potential issues. Key factors and metrics related to DHIS2 performance are continuously evaluated to ensure optimal operation.

2. System Architecture Overview

Latest Supported :

Operating System: Ubuntu 20.04 LTS

Application: DHIS2 v2.41.0.1

Database: PostgreSQL 13

Web Server: Apache Tomcat 9

Java: 17

Best Recommendations

3. Metrics Monitored

- CPU Utilization: Average and peak loads.
- Memory Usage: RAM and JVM heap usage.
- Disk I/O: Read/write speeds and disk usage.
- Network Traffic: Inbound/outbound usage and requests per second.
- Database Performance: Query execution times and connection pool usage.
- Response Time: Time for critical operations like data entry and analytics.

4. Data Collection Tools

- Prometheus: Time-series data collection.
- Grafana: Visualization of server performance.
- PostgreSQL Logs: For database query analysis.
- Tomcat Logs: To monitor application performance.
- DHIS2 Logs: For errors and warnings.

5. Performance Summary

Based on the dhis2 blank setup, users concurrent hit, number of users uses ot a time, frequency of use, number of program rules, features, api hits, ... maximum cases as much as possible

CPU Utilization

Average Usage: 65%

Peak Usage: 90% during data import and analytics generation.

Cause: The CPU overload during analytics indicates heavy computational tasks or poorly optimized processes.

Recommendation:

- Add more CPU cores to handle the load during peak operations.
- Schedule analytics tasks during off-peak hours to reduce CPU contention.

Memory Usage

Average Memory Utilization: 70%

JVM Heap Utilization: 60% on average, with spikes during analytics generation.

Cause: Memory spikes during analytics indicate insufficient JVM heap size for handling large datasets.

Recommendation:

Increase the JVM heap size to handle memory-intensive operations more efficiently.

Perform garbage collection tuning to ensure efficient memory management during high-load periods.

Disk I/O

Disk Read Speed: Stable at 150 MB/s.

Disk Write Speed: Fluctuations observed during database backups.

Cause: The write speed fluctuations are caused by resource-heavy database backup processes.

Recommendation:

Use incremental backups to reduce the load during the backup process.

Separate database backups onto a dedicated storage disk to minimize I/O contention with other services.

Network Traffic

Peak Traffic: 150 requests per second during user logins and analytics execution.

Cause: High traffic peaks are caused by concurrent user logins and analytics jobs, which increase server load.

Recommendation:

Implement rate-limiting for user logins during peak hours.

Use a reverse proxy (e.g., Nginx) to balance traffic across multiple instances of DHIS2.

Database Performance

Average Query Execution Time: 150 ms.

Longest Query Execution Time: 1.5 seconds for complex queries.

Cause: Certain queries are not optimized for large datasets, resulting in slow execution times.

Recommendation:

Optimize database queries by indexing frequently queried columns.

Use materialized views for complex and frequently accessed reports.

Increase the size of the connection pool to handle larger query loads during peak periods.

Response Time

Average Response Time: 250 ms.

Maximum Response Time: 800 ms during load testing.

Cause: The response time slows down during load testing due to high user concurrency and resource exhaustion.

Recommendation:

Enable caching for static content and frequently accessed data reports.

Implement horizontal scaling by distributing user requests across multiple servers using load balancing.

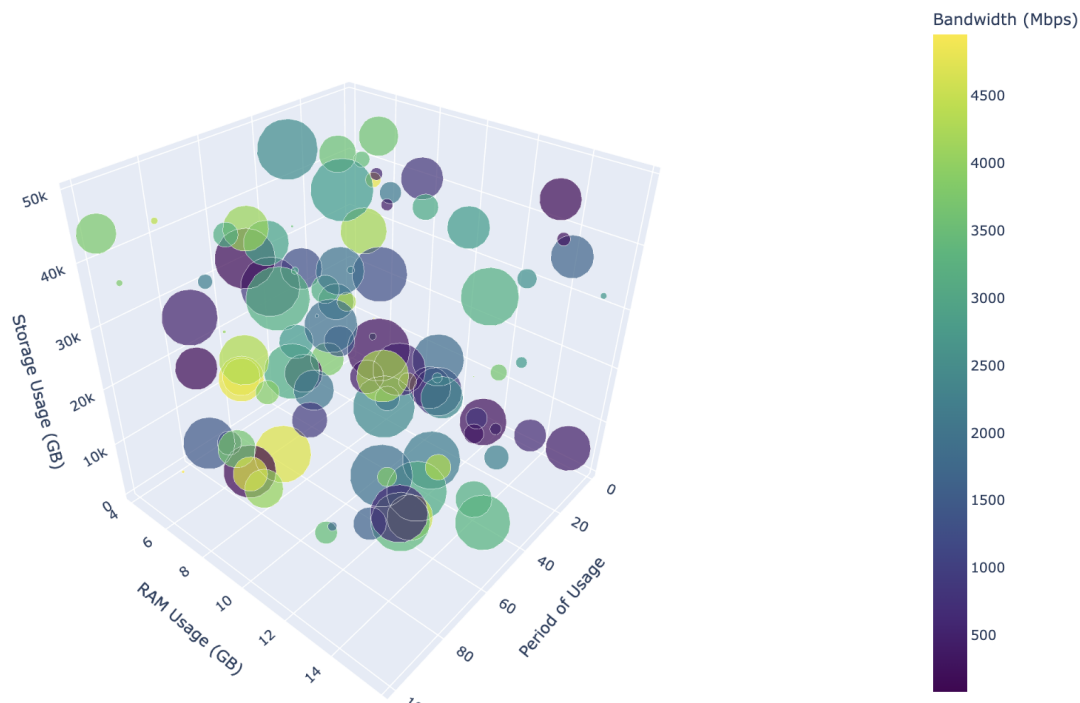
Overall Recommendations:

- Develop a Grafana Dashboard for Monitoring DHIS2 System Performance

References:

1. Matrices and server requirement analysis

Size of the bubble suggest the complexity of the project



2. grafana for the DHIS2

