Network Monitoring System with SNMP

This presentation provides a comprehensive overview of network monitoring solutions using SNMP, highlighting their benefits and implementation strategies.

Importance of Network Monitoring

Understanding the Necessity of Monitoring Networks

- **Ensures Network Reliability**

  Network monitoring guarantees consistent uptime and minimizes disruptions.

- **Enhances Performance**

  Proactive monitoring helps in identifying and resolving performance bottlenecks efficiently.

- **Reduces Manual Monitoring Efforts**

  Automation in monitoring eliminates the need for constant manual oversight, saving time.

- **Facilitates Quick Issue Detection**

  Real-time alerts enable rapid response to issues, minimizing downtime and losses.

- **Supports Business Continuity**

  Ensures that critical business operations remain uninterrupted through consistent oversight.

Innovative Solutions for Network Monitoring

Addressing Network Monitoring Challenges Effectively

- **Utilizes SNMP for Monitoring**

  The system leverages Simple Network Management Protocol to automate device monitoring effectively.

- **Reduces Manual Effort**

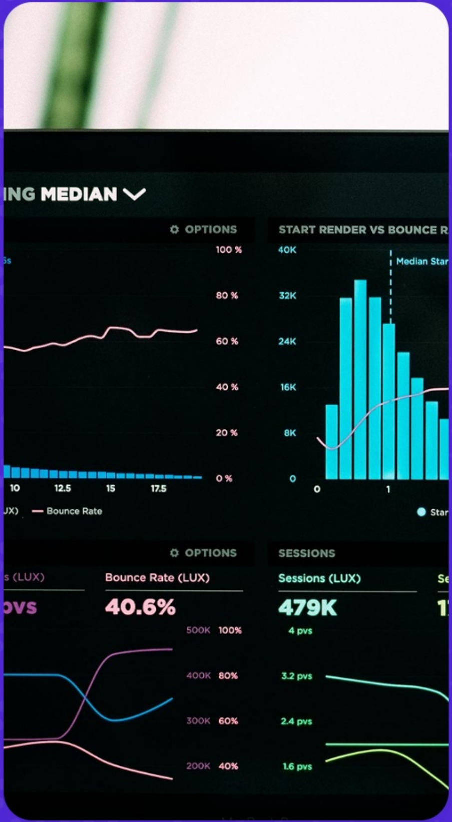
  Automated monitoring minimizes the need for manual checks, saving time and resources.

- **Faster Issue Detection**

  Real-time insights enable quicker identification of network issues, enhancing response time.

- **Enhances Automation Capabilities**

  The system supports advanced automation features, streamlining network management tasks.



Comprehensive Technology Stack Overview

Exploring the components of our network monitoring system

- **Go Programming Language**

  Utilized for the polling engine and data collection processes, ensuring efficient performance.

- **PostgreSQL Database**

  Selected for its robust storage capabilities, particularly effective with JSON indexing.

- **Vert.x Framework**

  Employed for managing API requests and enabling event-driven communication in the system.

- **ZeroMQ (ZMQ)**

  Facilitates rapid brokerless communication between Go and Vert.x, enhancing system responsiveness.

User Workflow Steps for Device Polling

A detailed overview of the user steps

- **Create Credential Profile**

  Establish a reusable profile with login details for SNMP devices.

- **Create Discovery Profile & Run Discovery**

  User initiates the discovery process to identify available devices.

- **Start Polling (if successful)**

  Begin data collection from discovered devices if the discovery was successful.

- **View Data via Provisioning Job ID**

  Users can fetch real-time metrics using the job ID from provisioning.

Enhanced System Features Overview

Explore the System's Key Metrics and Features

- Top Interfaces by Error Rate
  - Identify interfaces with the highest error rates to target improvement efforts.
- Top Interfaces by Speed
  - Highlight interfaces with optimal speed for better performance assessment.
- Top Interfaces with Most Restarts
  - Analyze interfaces that frequently restart to enhance system stability.
- Collected Metrics Overview
  - Comprehensive metrics collected for each device to support performance monitoring.
- System Name & Description
  - Details about each system's identification and function for clarity.
- System Location
  - Geographical data on system locations to facilitate network management.
- System Uptime
  - Monitoring system uptime to ensure reliability and availability.
- Total Packets Received/Sent
  - Track the total packets to evaluate data flow and performance.
- Interface Speed Metrics
  - Measure the speed of each interface to ensure optimal performance.
- Error Packets Analysis
  - Assess the error packets sent and received for troubleshooting.
- Discarded Packets Overview
  - Review discarded packets to identify potential network issues.

Schema Diagram

Database Schema Diagram

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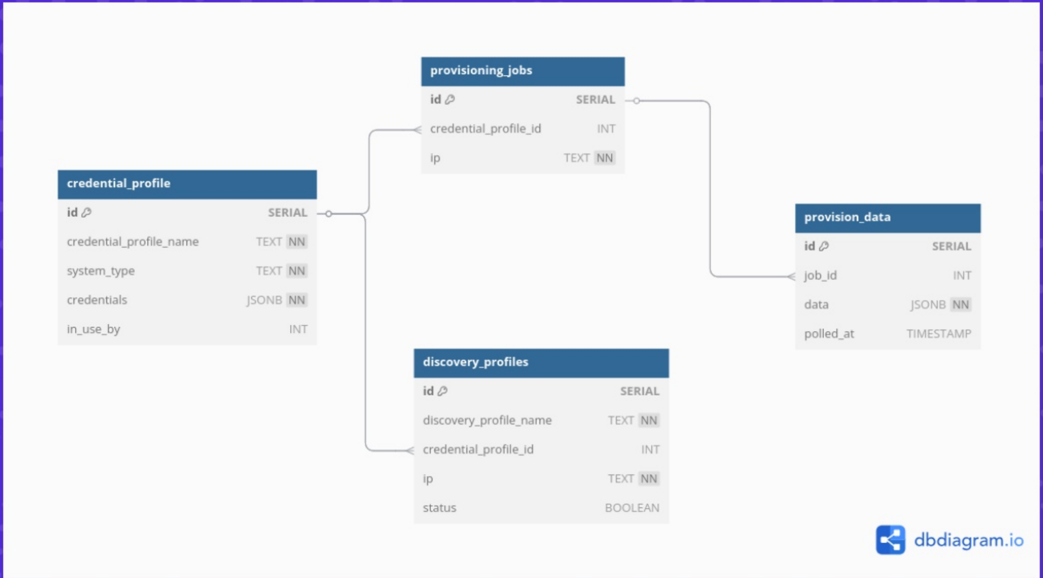

provisioning_jobs		
id	SERIAL	
credential_profile_id	INT	
ip	TEXT	NN

credential_profile		
id	SERIAL	
credential_profile_name	TEXT	NN
system_type	TEXT	NN
credentials	JSONB	NN
in_use_by	INT	

provision_data		
id	SERIAL	
job_id	INT	
data	JSONB	NN
polled_at	TIMESTAMP	

discovery_profiles		
id	SERIAL	
discovery_profile_name	TEXT	NN
credential_profile_id	INT	
ip	TEXT	NN
status	BOOLEAN	

Plugin Engine Flow (Go)

Understanding the Plugin Engine Workflow

1. **ZMQ Router Listens for Requests**

   The ZMQ Router acts as the entry point for incoming requests to the Plugin Engine, ensuring efficient communication.

2. **Router Sends to Dealer**

   Upon receiving a request, the Router forwards it to the Dealer for processing and distribution to Workers.

3. **Dealer Distributes to Workers**

   The Dealer is responsible for distributing the received requests to multiple Worker REP Sockets for parallel processing.

4. **Workers Fetch Data from SNMP**

   Workers communicate with SNMP devices to fetch the required data, ensuring accurate and timely responses.

5. **Responses Sent Back to Dealer**

   Once the Workers have fetched the data, they send the responses back to the Dealer for aggregation.

6. **Dealer Forwards to Router**

   The Dealer aggregates the responses and forwards them back to the Router for the final delivery.

7. **Router Sends to Vert.x**

   Finally, the Router sends the aggregated responses back to the Vert.x (ZMQ Messenger) for further processing.

Enhancing Query Performance with Indexing

Leveraging Indexing for Optimal Data Management

- **Importance of Indexing**

  Indexing is crucial for improving query performance, especially with large datasets.

- **SNMP Data Challenges**

  Large-scale SNMP data presents challenges in query efficiency without proper indexing.

- **Role of JSONB Indexing**

  JSONB indexing is particularly effective for querying complex data structures.

- **Performance Enhancement**

  Utilizing indexes can significantly reduce query response times and resource consumption.

- **Practical Applications**

  Implementing indexing strategies can lead to better data retrieval in real-time applications.

Justifying Our Technology Stack Choices

Exploring the Rationale Behind Our Choices

- **Why Go?**

  Utilizes efficient worker-based processing with goroutines, enhancing performance.

- **Faster Execution**

  Go outperforms thread-based execution, especially for network requests.

- **Why ZMQ?**

  ZeroMQ is fast, lightweight, and brokerless, perfect for efficient messaging.

- **Why PostgreSQL?**

  Supports JSONB for flexible SNMP data storage and high-performance indexing.

- **Event-Driven with Vert.x**

  Vert.x employs an event-driven architecture for handling multiple concurrent requests.

- **GitHub Copilot's Assistance**

  GitHub Copilot aids in debugging, suggesting SQL queries, and generating code snippets in Go & Vert.x.

- **Claude & DeepSeek Support**

  These tools help understand complex implementation issues and structure API endpoints efficiently.

- **Optimizing Development Processes**

  AI contributes to optimizing processes such as better indexing strategies for PostgreSQL.

- **Streamlining Communication Pipelines**

  AI recommends efficient structuring of ZMQ communication pipelines to enhance performance.

- **Handling Concurrent Requests**

  AI provides alternative approaches for efficiently managing concurrent SNMP requests.

Harnessing AI in Software Development

Exploring AI's Impact on Development Efficiency

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