Drashti - Network Monitoring Tool

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Master of Computer Application

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DECLARATION

We hereby declare that the project entitled **"Drashti - Network Monitoring Tool"** submitted by me for the partial fulfillment of the requirement for the award of Master of Computer Application Technology (6 Years) Semester IX to International Institute of Professional Studies, Devi Ahilya Vishwavidyalaya, Indore, comprises my own work and due acknowledgment has been made in text to all other material used.

Signature of Student:

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CERTIFICATE FROM GUIDE

This is to certify that dissertation on **"Drashti - Network Monitoring Tool"**, submitted by Mr. Deepak JOSHI, to the International Institute of Professional Studies, DAVV, Indore has been completed under my supervision and the work is carried out and presented in a manner required for its acceptance in partial fulfillment for the award of the degree of "Master of Computer Application (6 Years) Semester IX ".

Project Guide: Prof. Jugendra Dongre
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CERTIFICATE

This is to certify that we have examined the dissertation on **"Drashti - Network Monitoring Tool"**, submitted by Mr. Deepak JOSHI, to the International Institute of Professional Studies, DAVV, Indore and hereby accord our approval of it as a study carried out and presented in a manner required for its acceptance in partial fulfillment for the award of the degree of "Masters of Computer Application (6 Years) Semester IX".

Internal Examiner

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Name **:** _____

Date **:** _____

External Examiner

Signature**:** _____

Name **:** _____

Date **:** _____

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Deepak JOSHI (IC-2K16-14)

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Abstract

This applications is created to collect data for network management applications.The purpose of this application is to collect useful information from various parts of the network so that the network can be managed and controlled using the collected information.As more people communicate using networks, networks have become bigger and more complex.At this age of big and complex networks, network monitoring applications need to use effective ways of checking the status of their networks so that network administrators can easily understand the network and provide economical and high-quality networking services to the users.

The goal of this application is to monitor every device on the network and show complete information in real time to the administrator. This application also deals with fault monitoring in the network. If any server is suddenly shut down due to unknown reason, the administrator will be notified immediately to take necessary actions.

Introduction

Objective

To develop a network monitoring tool which will activity monitor all the network devices connected on the same Local Area Network.

Network Monitoring

Network Monitoring is an activity where all the networking components like routers, switches, firewall, servers and VMs are monitored for fault and performance and evaluated continuously to maintain and optimize their availability.

Importance Of Network Monitoring

Faulty network devices impact network performance. This can be eliminated through early detection and this is why continuous monitoring of network and related devices is essential. In effective network monitoring, the first step is to identify the devices and the related performance metrics to be monitored. The second step is enable frequent monitoring on device like servers, routers and switches because they perform business critical tasks but at the same time have specific parameters that can be selectively monitored.

Description

This tool is named “Drashti” which means “Vision of Eye” in Hindi. This is developed to allow network administrators to actively monitor essential network devices.Network downtime can cost a lot of money. In most cases, the end-user reports a network issue to the network management team. The reason behind this issue is a poor approach to proactive network monitoring. The key challenges in network monitoring is to identify availability of essential resources.
Monitoring networks has become an important aspect of managing any IT infrastructure. Similarly, a network assessment is considered an elementary step in aligning your IT infrastructure towards the business goals.

This tool comes in the pack of essential network monitoring capability to deliver administrator friendly services. Drashti Network Monitoring Tool offers many features that allow network administrators to monitor network activities.

Following are some key features.

1. Monitoring The Essentials -

   Faulty network devices impact network performance. This can be eliminated through early detection and this is why continuous monitoring of network and related devices is essential. In effective network monitoring first we need to identify the devices that are very important for the infrastructure. Some examples for the essential devices are file server, web server, database server, firewall, switches, router etc. These types of devices perform critical business tasks that are very important for the functioning of a system in a distributed environment.

2. Listing entire Infrastructure -

   In this tool the user can create a list of all the known devices and can also further classify the devices or nodes on the basis of logical groups i.e, Nodes and Server. This will help to define which network device is essential or not.

3. Keep track of Outages -

   In a computer system it can happen that any device could encounter a crash and will stop working. This could lead to serious business loss as some devices carry critical tasks. It is important to monitor if any of the essential network nodes is down. This tool provides great usability when it comes to outages. The application will notify the admin if any essential device is out of reach in the network.

4. Helps to Fix issue -

   Consider a situation where your system is generating wrong output and you are unable to identify issues in a distributed network. By active monitoring of network you can simply identify which node is causing the issue in the system. Using this application troubleshooting issue is easily done with a unified platform.

5. Provide Real Time information -

   These tools offer great use when it comes to real time monitoring. Consider a situation where your system is performing slower that usual. This tool will actively monitor the Round Trip time to each node by sending an ICMP packet and tracking the time in milliseconds. If round trip time of any node is more than usual than it means that device is facing network stability issues.

6. Visualization -

   When an infrastructure has a more complex network and large number of devices it is a very tedious job to look for performance. This tool offers a visualization technique to visualise the status of a network in the form of Graphs and Charts.

7. Manage growing network -

   In a network infrastructure generally there is only one administrator responsible. With a growing network it is impossible to handle such complex tasks by one person. This application manages any number of devices that are connected to the network and will keep record of all the parameters in a systematic manner.

Requirements

Hardware Requirements

In order to proactively monitor the network a machine is required which can run this application.
The machine should provide performance to run a webserver and background script. This machine should be available all time.

Following are the key specification

1. Processor : Any processor with at least Dual core with any architecture.

2. Memory : At least 1 GB of RAM required that can handle web server, database server and a background script.
3. Hard Disk : At least 16 GB of storage.

Software requirements

This tool is developed by utilizing frameworks that are responsible for performing key activities.

Following are the list of software Requirements

1. Operating System - Any 32 bit or 64 bit operating system running Linux or UNIX based operating system on which all the required applications can be installed. This can also be a guest operating system in a virtualized environment.

2. Browser - Any modern web browser last updated in 2018 or later with JavaScript enabled with HTML5 compatibility.

3. Python3 Interpreter - Python3 should be installed on the host system as the core functionality is written in Python.

4. Flask - It is a micro web framework written in Python. This framework is used for web servers.

5. Database - This application keeps all the information in a single database on MySQL. The MySQL server should be installed on the host machine .

Frameworks and Libraries

1. Mysql-connector-python

   It is used to establish connection between MySQL server and Web Application using flask.

2. Flask-Mail

   This library is used to allow applications to send email for important alerts to the administrator.

3. subprocess

   This is a python library that is utilized by this application to run ping commands and calculate round trip time.

4. Argon Dashboard

   To provide a rich user interface in monitoring the network. Argon is used as a frontend template. It is licensed under the MIT License.

5. AM Charts

   It is a Javascript library for data visualization needs. This application uses amcharts for creating beautiful and interactive charts for better readability of network statistics.

Feasibility Analysis

Technical Feasibility

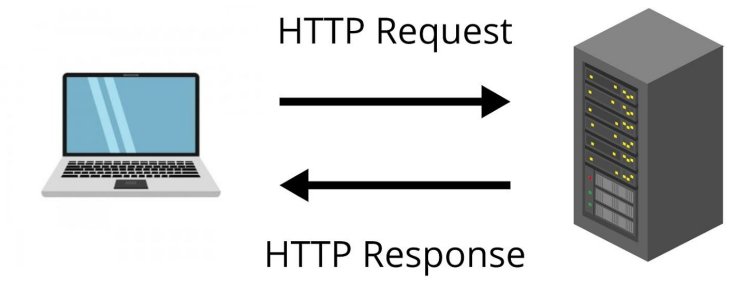
This application can run on the above mentioned hardware with proper setup of web application server and database server with running background script for active monitoring with Internet connection to send real time alerts.

Economic Feasibility

Implementation cost is only around setting up all the required hardware with proper electricity supply and an active internet connection.

Design

1. Web Application



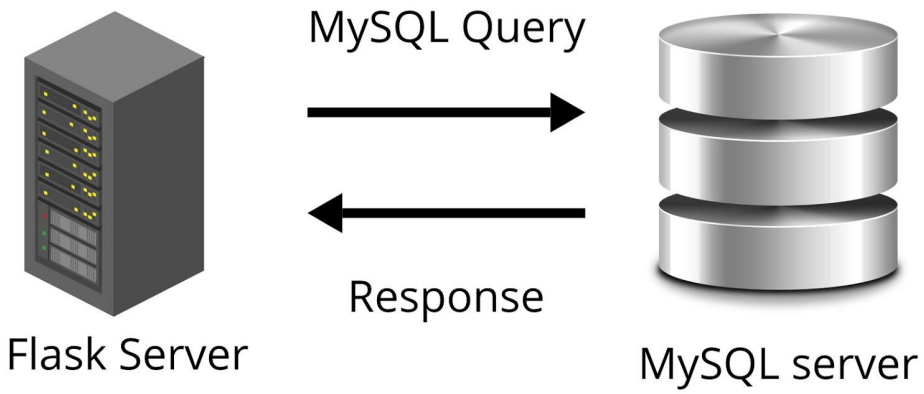
The client with updated web browsers sends HTTP request to the Flask Web server which then process the response using Jinja web template engine to provide dynamic content. The web server connects to the server through HTTP protocol.

The Web Application have following endpoint to retrieve information :-

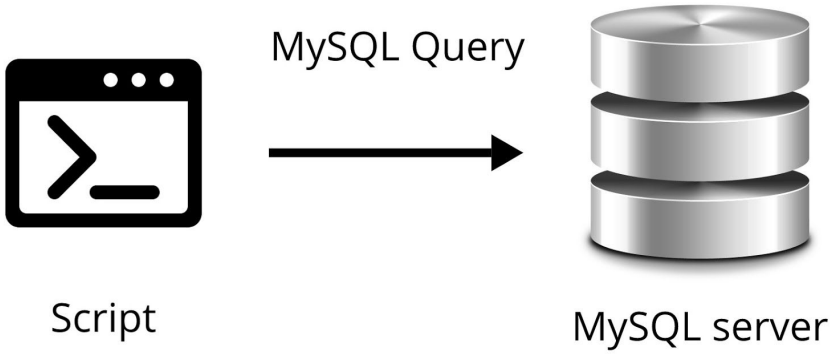
a. / : TO redirect user to login
b. /waninfo : To Return Wan Info Page
c. /loguser : To log user login in db
d. /login : To authorised user credential
e. /dashboard : Return main page of the application
f. /notification : Returns notification page and allows to add new email
g. /testnotification : Sends test email to all the listed emails
h. /nodes : Return information of all the nodes in JSON format
i. /servers : Return all the information of all the server in JSON format
j. /stats: returns information to show on dashboard
k. /shownodes : Return Nodes Page

l. /faq : Returns FAQ page
m. /showlogs : Return Logs page
n. /showserver : Returns server page
o. Scannetwork : Returns scan network page
p. Scan IP : Returns 1 if the ip is active and 0 is IP is inactive.
q. /addip : Add the IP to list of nodes
r. /add server : Add the node to server list.
s. /removeserver : Remove the node from server list.
t. /removenode : Remove the node from the node list.

2. Database Design



The flask server communicates with the database to store and retrieve information essential for network monitoring.



Background script also makes connection to the database to keep a real time record of network information.

Following is the list of tables and their columns

Login

a. Username
b. password

Logs

a. Username
b. Timestamp

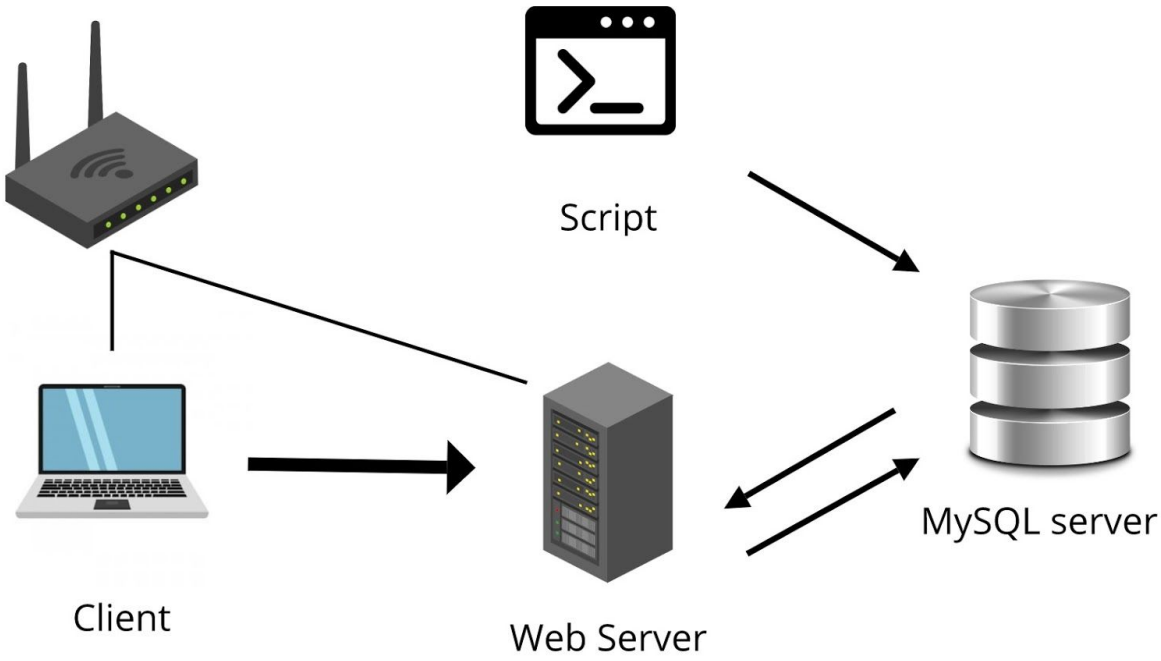
Nodes

a. Name
b. IP
c. Description
d. Server
e. Status
f. Round trip time

Notification

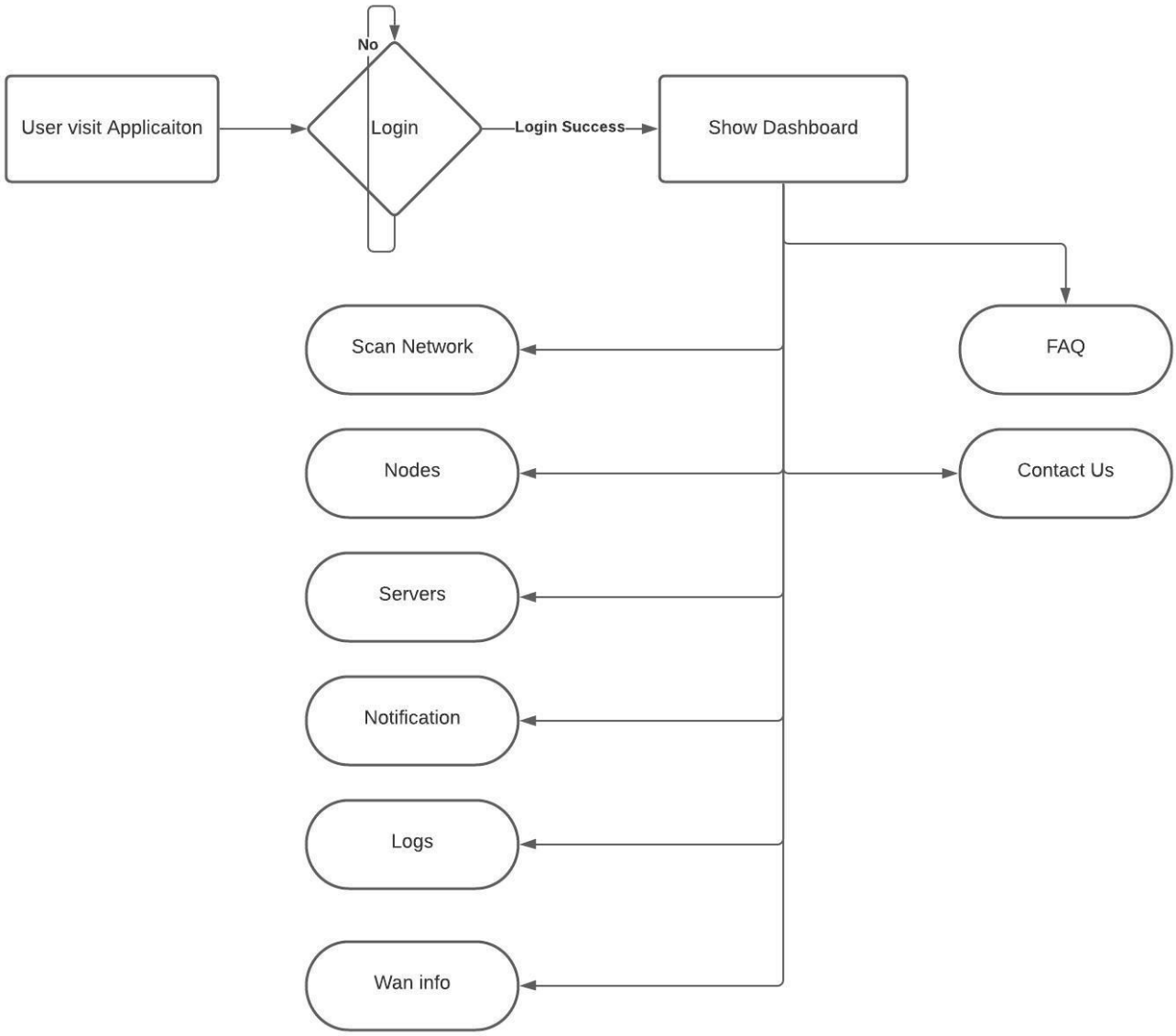
a. email

3. Network Design



All the devices including the client and web application server are connected to tha main router on the same level.

User Workflow

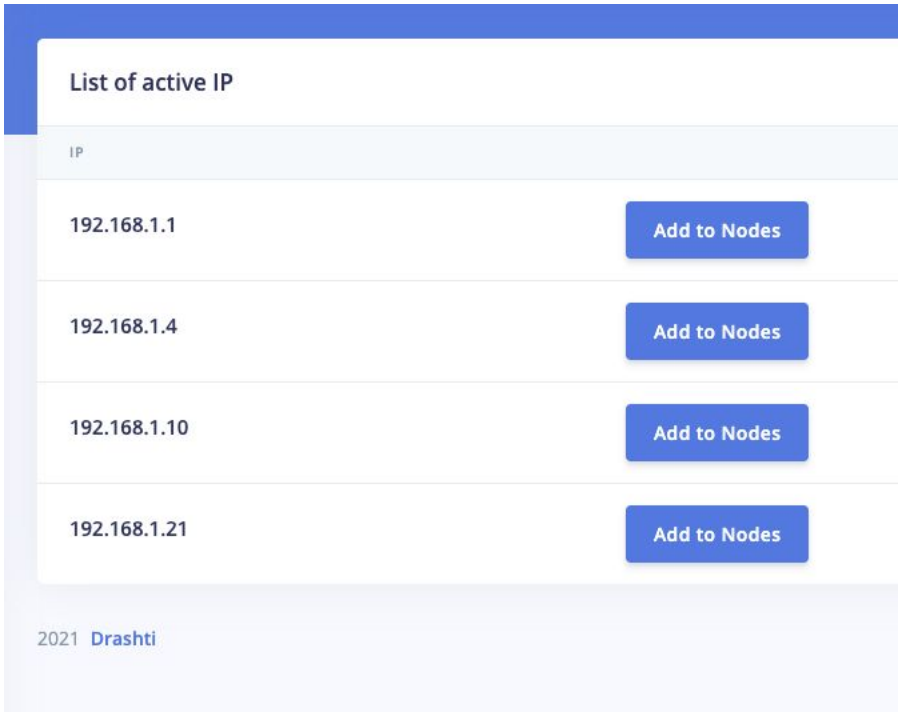


Implementation and Proposed Work

This application will provide a unified platform with a rich user interface to allow network administrator to easily monitor network activities. Following are the list of features offered by Drashti network monitoring tool.

1. Active Scan

   This feature allows the user to identify all the network devices with easy of clicking on a button. This feature uses ping functionality provided by the operating system to send ICMP packets to all the nodes and receive response. Those devices who reply to the ICMP message are listed to be used on a single page with a button to add a device to the list of known devices calles nodes list.



2. Wan Info

   This feature provides information about the Wide Area Network to which the network is connected. It is important to have an active internet connection to send real time updates via email. This feature gives following information

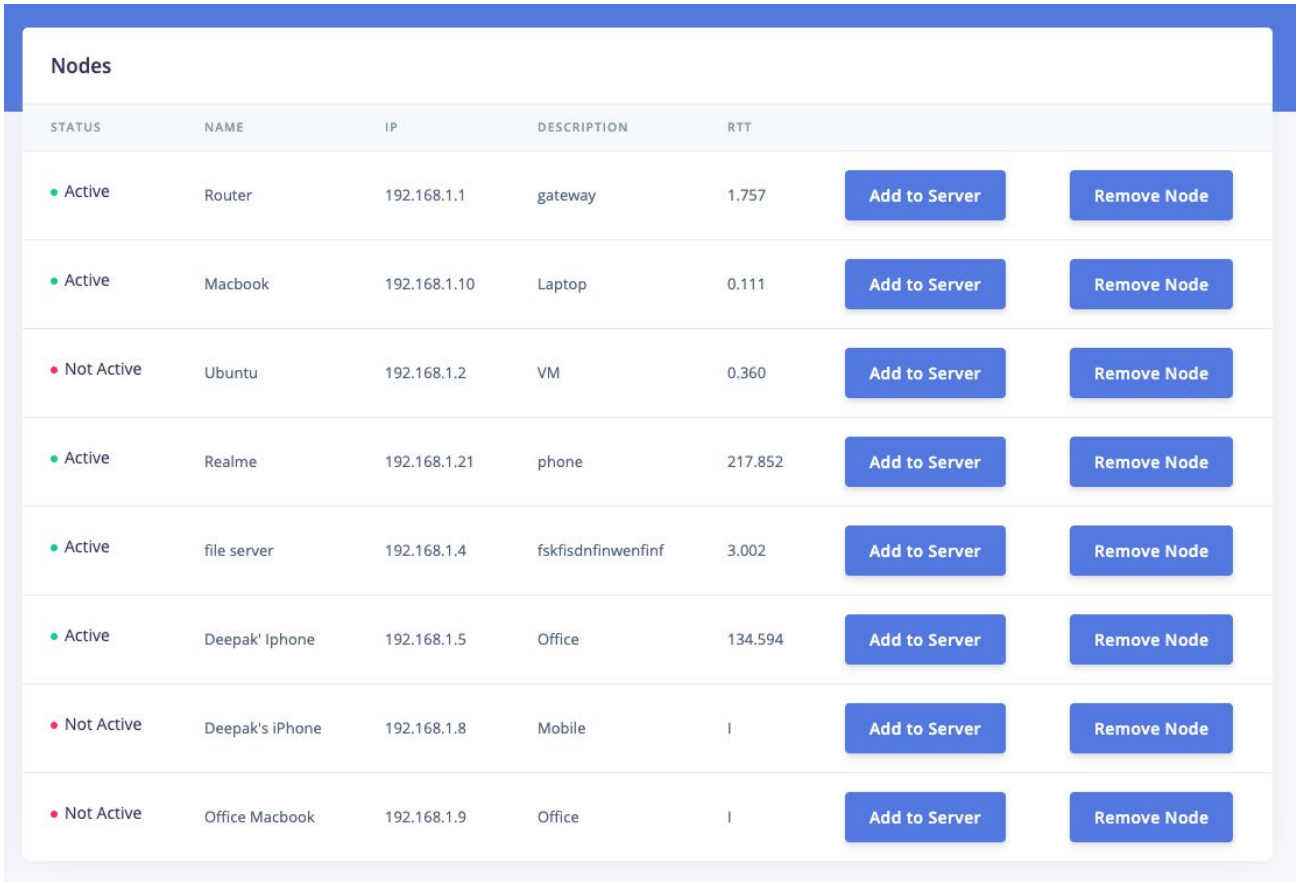
   a. Location
   b. Wan IP
   c. Internet Service Provider
   d. Timezone

3. Nodes

This gives list of all the devices that are added after scanning of network with all the following information

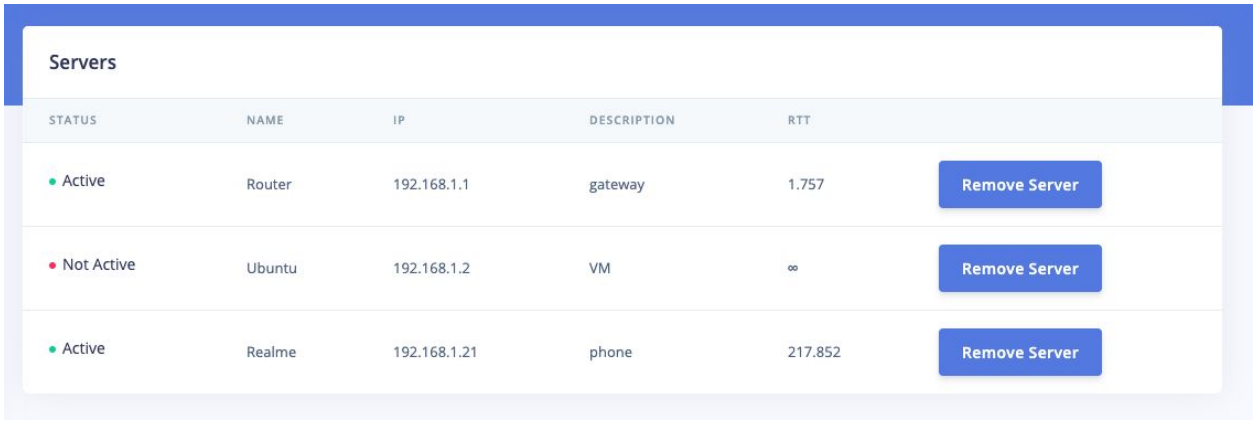
a. Status (Active or Inactive)
b. Name
c. IP address
d. Description
e. Round Trip time

With a button to easily add any node to the server list and another button to delete the node from the list of known devices.



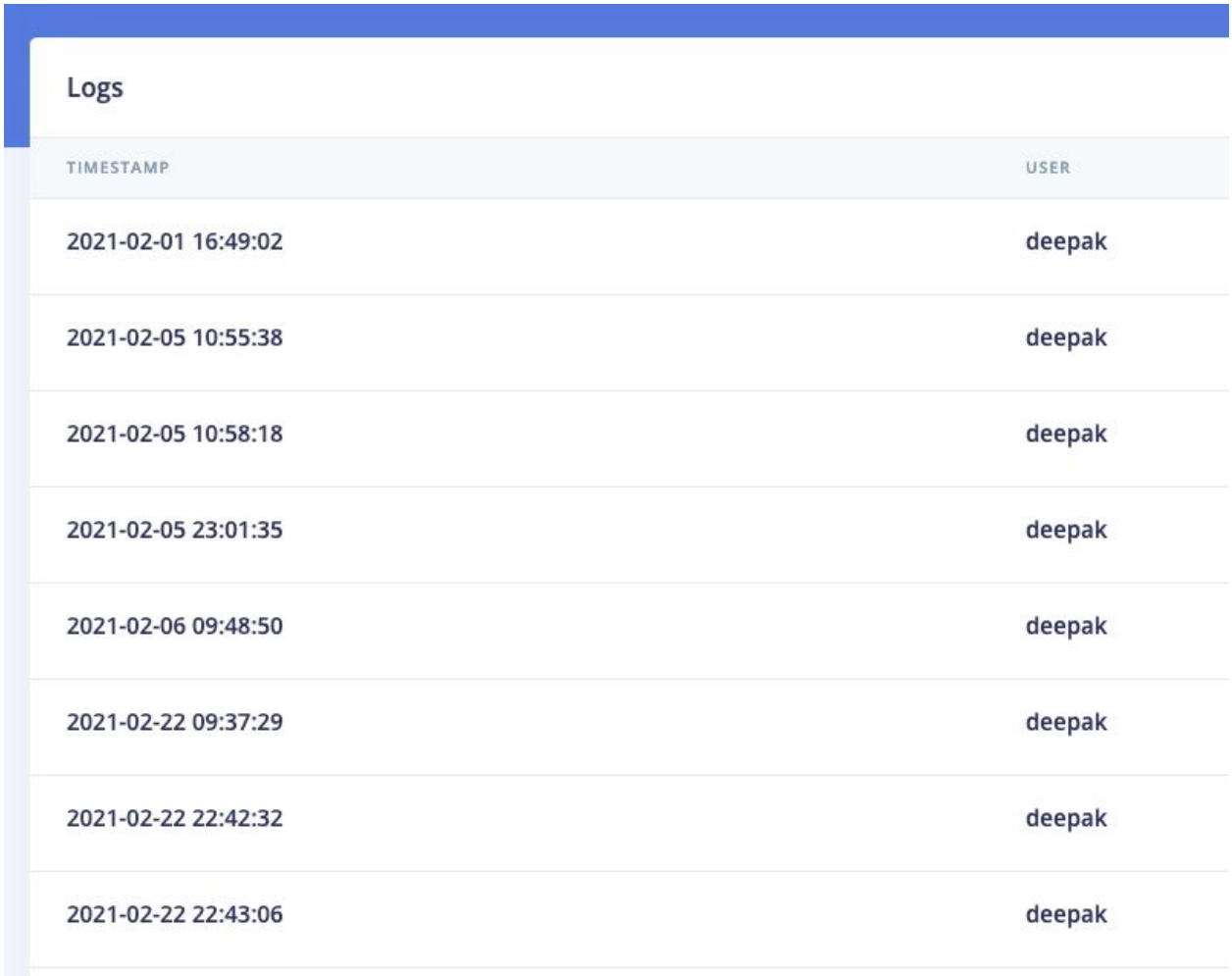
4. Servers

This is the list of nodes that are explicitly marked as servers for actively monitoring. If any of the servers is unable to reach the network or is experiencing a downtime. The administrator of the network will be immediately notified via email.



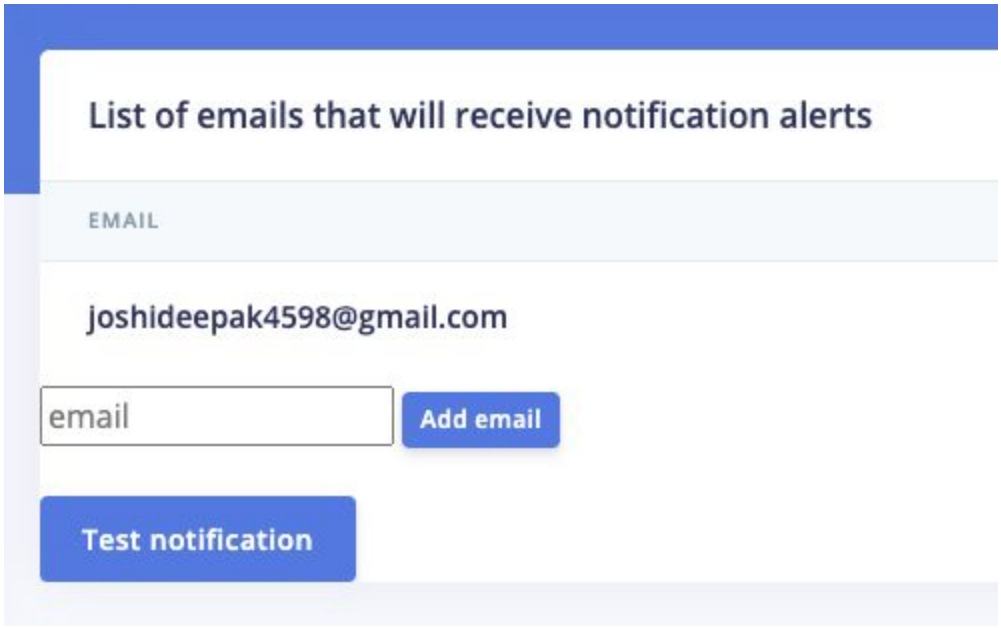
5. Logs

It includes entries of user login to the application with exact timestamp and username.



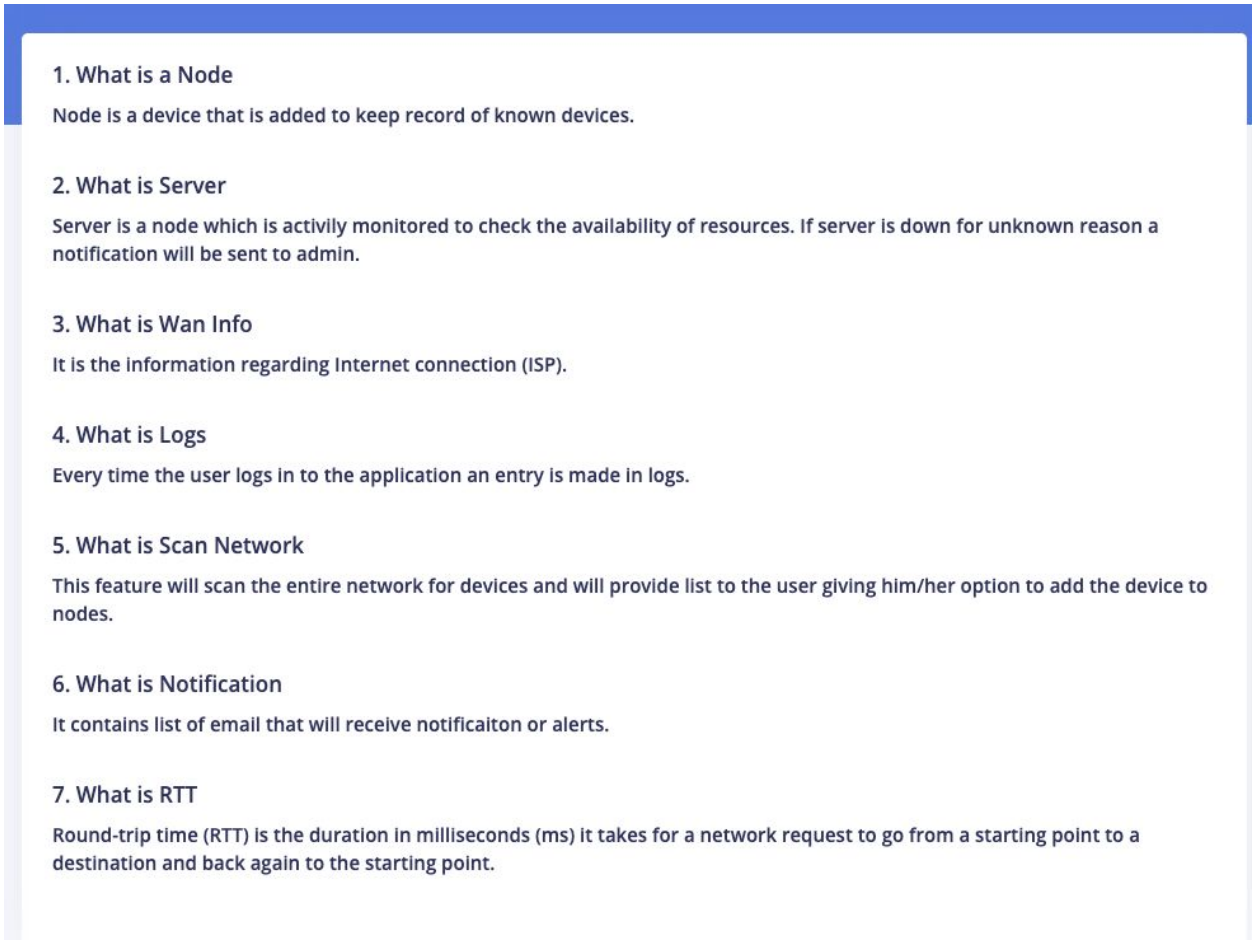
6. Notification

This feature allows the admin to add email that should be notified for important alerts. It provides you the list and a field to add new email. Also there is test notification button which sends a test email to all the emails listed.



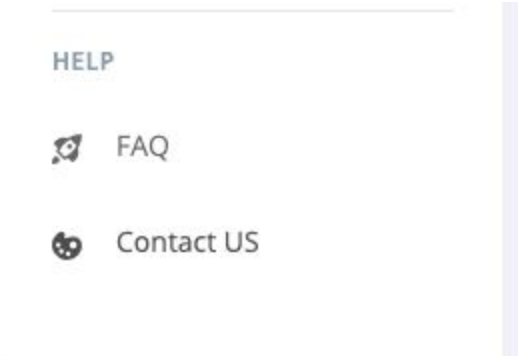
7. FAQ

This section includes some common FAQ regarding the application.



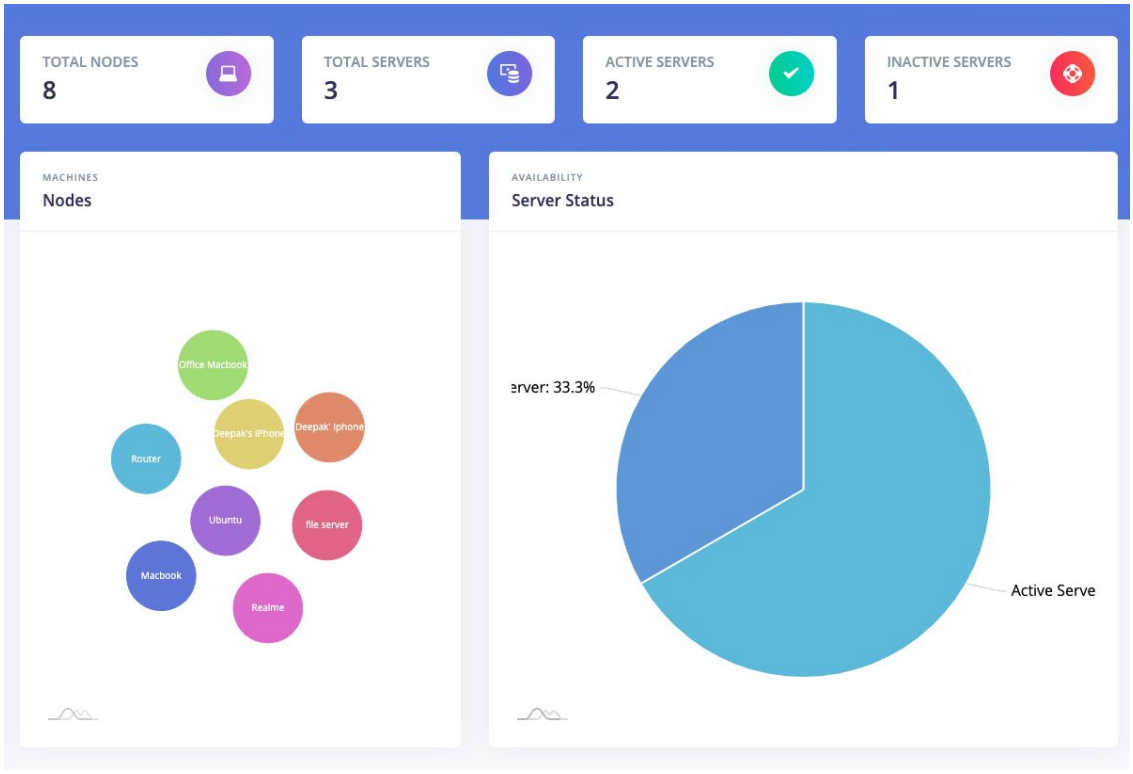
8. Contact Us

This is a button of mailto link that will open your mail client to send email to the developer where you can ask for support.



9. Dashboard

It provides visual representation of network information to the user. With number on the top to quickly see the status of network infrastructure.



10. Background Application

This is a script which is responsible for active monitoring of all the nodes connected to network infrastructure. It provide following functionality

a. Keep track of all active devices
b. Keeps track of all inactive devices.
c. Collect information of round trip time of each device.
d. Alert network administrator is a case of server outage via email.

This script is written in python and should be executed all the time.

Available Options in Market

There are options available in the market that can perform different activities for Network Monitoring. Below is the list of similar application.

1. **SolarWinds Network Performance Monitor** :- The leading network monitoring system that uses SNMP to check on network device statuses. This monitoring tool includes autodiscovery that compiles an asset inventory and automatically draws up a network topology map. Runs on Windows Server.
2. **Datadog Network Monitoring (FREE TRIAL)** Two packages from a cloud-based platform that offer network traffic monitoring and network device monitoring.

Above two are popular options available in the market but they require premium subscription to enable full use. The pricing is quite high, that is why This application was developed to provide similar services at minimum cost.

Conclusion

Managing a network is a very big functional area along with performance, device maintenance, performance monitoring, troubleshooting, plan of change and etc.Monitoring is a very important issue in an organization network which arose over the time. Monitoring is the only way to find out whether the network is functioning according to plan. In order to know what is happening in a network,how its functioning at any given time. This activity can be easily done by the Drashti Network Monitoring tool.It lets the user know the status of the network at any given time. This logging can give the user a wide view what can't be seen in general.The purpose of this project is to get an overall idea about the importance of network monitoring and what are the facts need to be considered while monitoring a network.Monitoring a network with the least effects on network performance is the best solution in case of monitoring.The outcome from these monitoring tools is a wide range of useful data and integration of these data produces the status of the network at any given time.Moreover these data will be logged to create a statistical report. Different users such as a network admin and organization can use this information from different perspectives to make a network more efficient for users.

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