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Shine more brightly

# Implementing IoT on MikroTik Product for NMS purpose.

Muhammad Nanda Jabar Rozaq

Position: *Anak Bapak Ibu + Calonmu (hiya siapa?)*

# MikroTik : Routing the world!
# Me : Routing your heart!

Searching . . . .

*Trying to connect . . .*

***Heart not found!***

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# Who I am?

**Muhammad Nanda Jabar Rozaq (21)**

- Product Manager – SekolahStartup
- Software Engineer – DTEDI SV UGM
- CEO and Founder – Gone Sinau
- Software Dev for Tech Ops - Midtrans

# Campus

**Finalist Allianz Indonesia Master Class (on going)**
2020 – Allianz Indonesia

**Favorite Winner Hackathon BCA Young HackR**
2020 – Bank Central Asia

**3rd Winner Best Expo Indonesia Student Entrepreneur Award**
2019 – Ministry of Research and Technology of the Republic of Indonesia

**3rd Winner Business Plan Competition**
2019 – Fakultas Ekonomi dan Bisnis Universitas Jember

**International Ideathon/Hackathon Robotic x IoT x Mobility Japan**
2019 – PROPOLYS JAPAN

**1ST Winner of Indonesian Incubantion Young Sociopreneur**
2018 - Fakultas Ilmu Sosial dan Ilmu Politik UGM

# Activity

**Leader of the Organization**
2020 – Forum Komunikasi Teknologi Rekayasa Internet SV UGM

**Leader of the Startup – Gone Sinau**
2019 – Student Entrepreneurship Program UGM

**Co-Founder Startup of Explore Klaten**
2019 – Student Entrepreneurship Program UGM

**Staff Human Resource Development**
2019 – Keluarga Mahasiswa Teknik Elektro dan Informatika

**Staff Creative Division**
2019 – Komunitas Mahasiswa TIK UGM

**Staff Most Outstanding Student Corner**
2019 – Penalaran Center Community SV UGM

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# Few years ago . . .

Teachers: Presenter session 2

Teachers: Presenter session 4

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# TODAY'S OUTLINE

1. **Problem Statement!**
2. **Internet of Things**
    a) Raspberry Pi
    b) Automation
3. **Network Monitoring System on MikroTik Product**
    a) SNMP
    b) Zabbix
4. **Demo (if possible)**
    a) Network Topology
    b) Device Configuration
    c) Trigger and Notification
    d) Data Visualization
5. **Today's Implementation and Future Plan**
6. **Q n A!**

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# disclaimer -/

*Maybe I’m not yet call as professional in this area.*
*I’m stand here as student from academic program*
*But, I hope this material that I deliver will be useful to others*

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# Problem Statement!

- Real time network monitoring?
- Network Monitoring System need big resources?
- Network problems but User know earlier than Network Administrator/Engineer?

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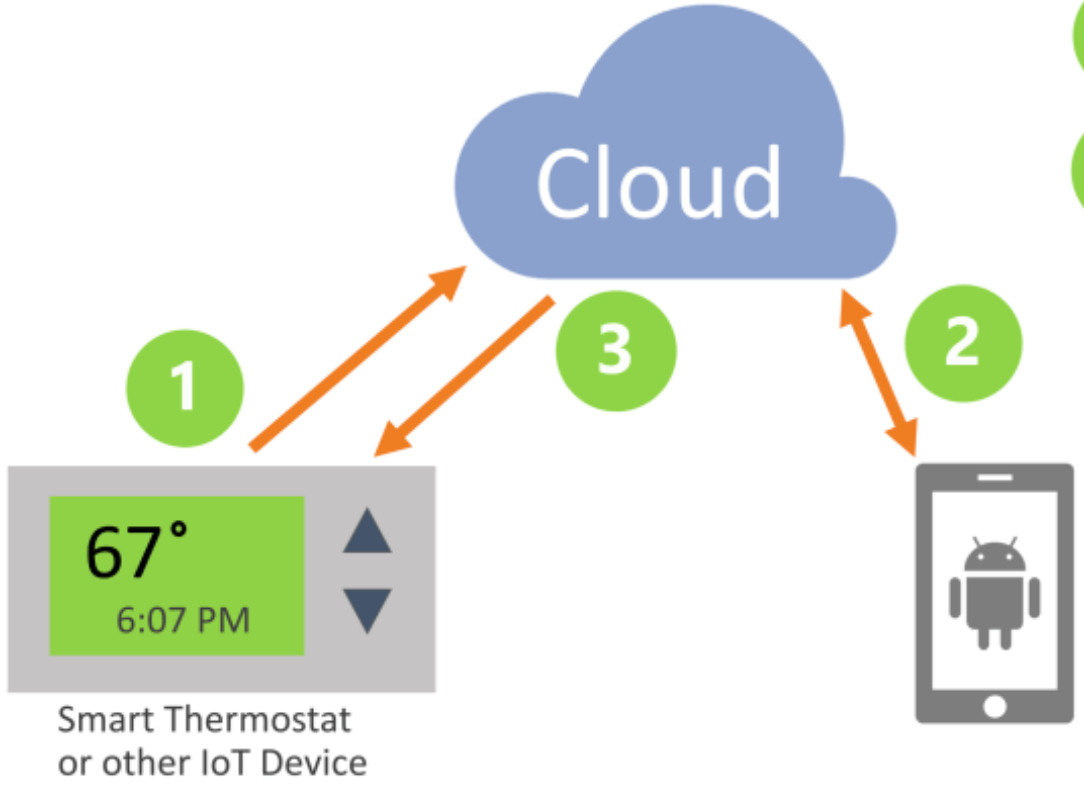
# Internet of Things!

## 2-Way IoT Messaging




1. Device-to-Cloud
2. User Interaction
3. Cloud-to-Device



Build Azure
All about the Microsoft Cloud

http://BuildAzure.com

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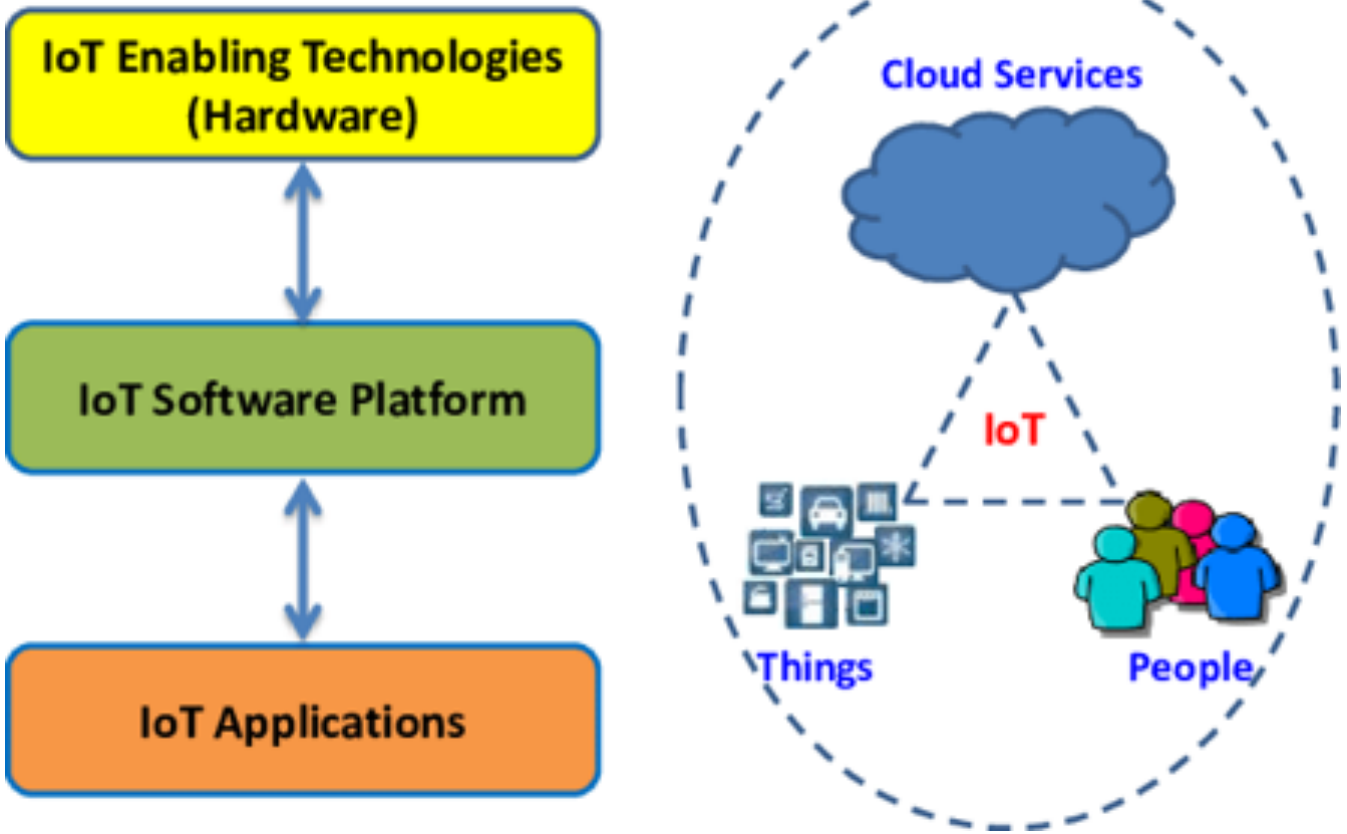
# IoT Architecture!



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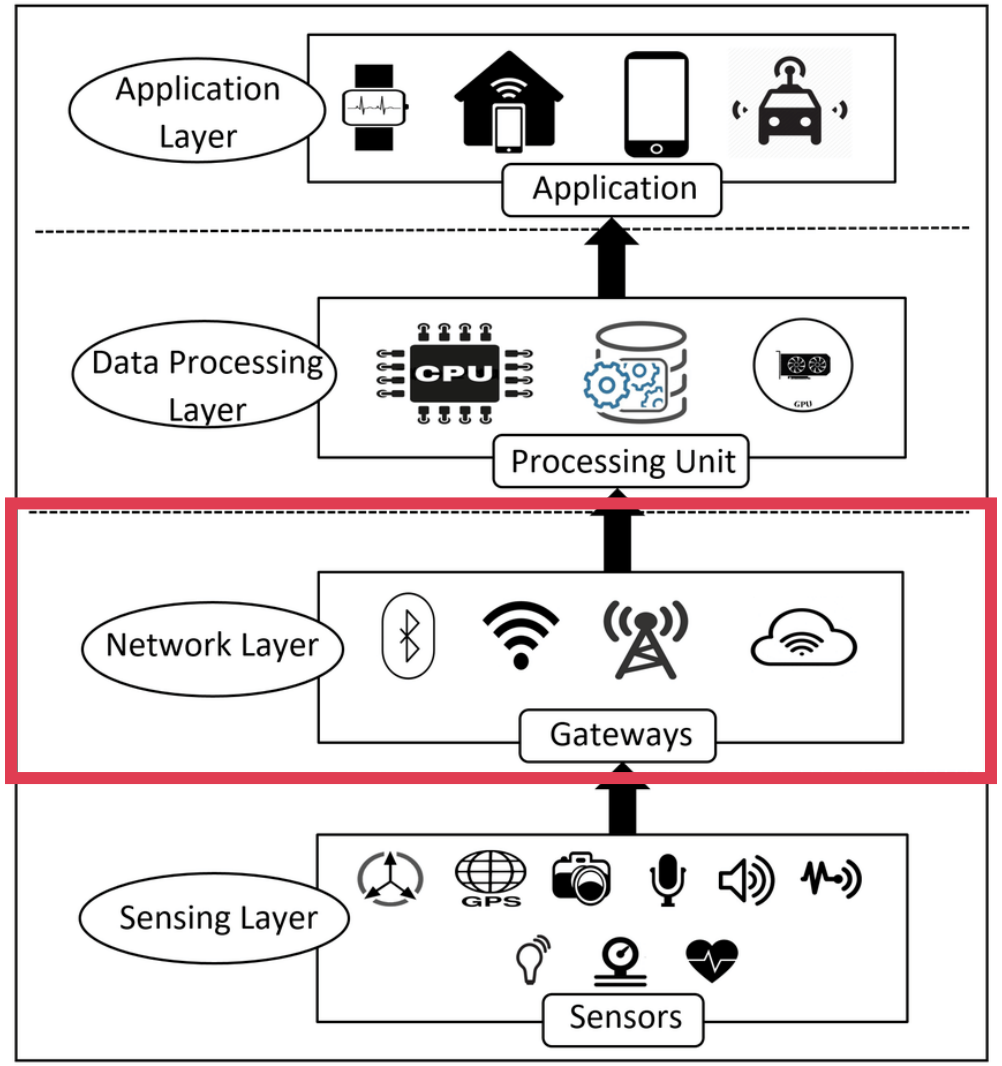
# IoT Architecture!



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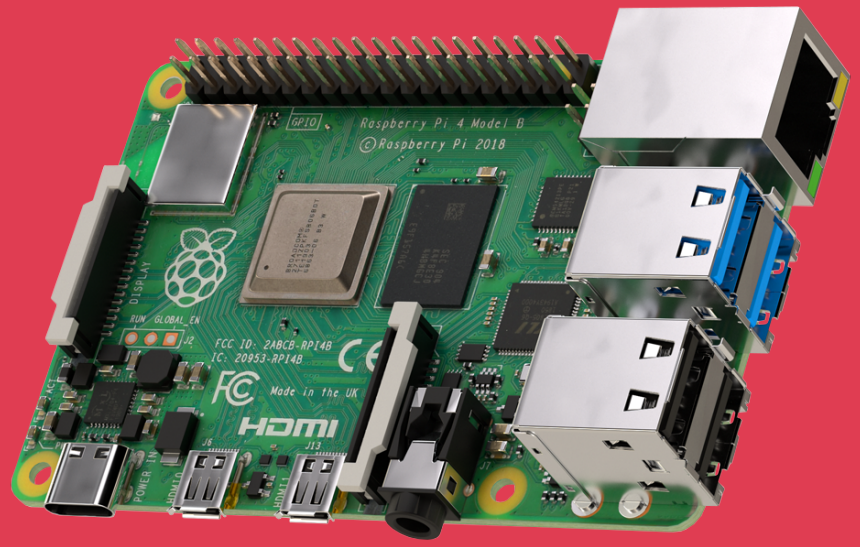
# Raspberry Pi




Small single board computers that can run computational process.

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# Raspberry Pi!

| | Raspberry Pi 3 Model B | Raspberry Pi Zero | Raspberry Pi 2 Model B | Raspberry Pi Model B+ |
|---|---|---|---|---|
| Introduction Date | 2/29/2016 | 11/25/2015 | 2/2/2015 | 7/14/2014 |
| SoC | BCM2837 | BCM2835 | BCM2836 | BCM2835 |
| CPU | Quad Cortex A53 @ 1.2GHz | ARM11 @ 1GHz | Quad Cortex A7 @ 900MHz | ARM11 @ 700MHz |
| Instruction set | ARMv8-A | ARMv6 | ARMv7-A | ARMv6 |
| GPU | 400MHz VideoCore IV | 250MHz VideoCore IV | 250MHz VideoCore IV | 250MHz VideoCore IV |
| RAM | 1GB SDRAM | 512 MB SDRAM | 1GB SDRAM | 512MB SDRAM |
| Storage | micro-SD | micro-SD | micro-SD | micro-SD |
| Ethernet | 10/100 | none | 10/100 | 10/100 |
| Wireless | 802.11n / Bluetooth 4.0 | none | none | none |
| Video Output | HDMI / Composite | HDMI / Composite | HDMI / Composite | HDMI / Composite |
| Audio Output | HDMI / Headphone | HDMI | HDMI / Headphone | HDMI / Headphone |
| GPIO | 40 | 40 | 40 | 40 |
| Price | $35 | $5 | $35 | $35 |

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# Zabbix Server


*3 things important in Zabbix*

**To implement NMS for MikroTik Product**

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ZABBIX

ZABBIX PRODUCT SOLUTIONS SUPPORT & SERVICES TRAINING PARTNERS COMMUNITY ABOUT US DOWNLOAD

Overview Platforms Why Zabbix Customer reviews

# Monitor any possible performance metrics and incidents in your network:

### Network performance

- Network bandwidth usage
- Packet loss rate
- Interface errorrate
- High CPU or memory utilization
- Number of tcp connections is anomaly high for this day of the week
- Aggregate throughput of core routers is low

### Network health

- Link is down
- System status is in warning/critical state
- Device temperature is too high / too low
- Power supply is in critical state
- Free disk space is low
- Fan is in critical state
- No SNMP data collection

### Configuration changes

- New device added or removed
- Network module is added, removed or replaced
- Firmware has been upgraded
- Device serial number has changed
- Interface has changed to lower speed or half-duplex mode

This is a sample list of network-related metrics and incidents, monitored by Zabbix out of the box. See the full list in template descriptions. You can extend/customize the scope of monitored objects by adding new items, writing custom data collection scripts, building custom templates, etc.

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ZABBIX


Out-of-the-box templates come with preconfigured items, triggers, graphs, applications, screens, low-level discovery rules, web scenarios, etc.

## More templates:

All official Zabbix templates:
zabbix.org

Community templates:
share.zabbix.com

Get help from Zabbix team:
Template Building Services

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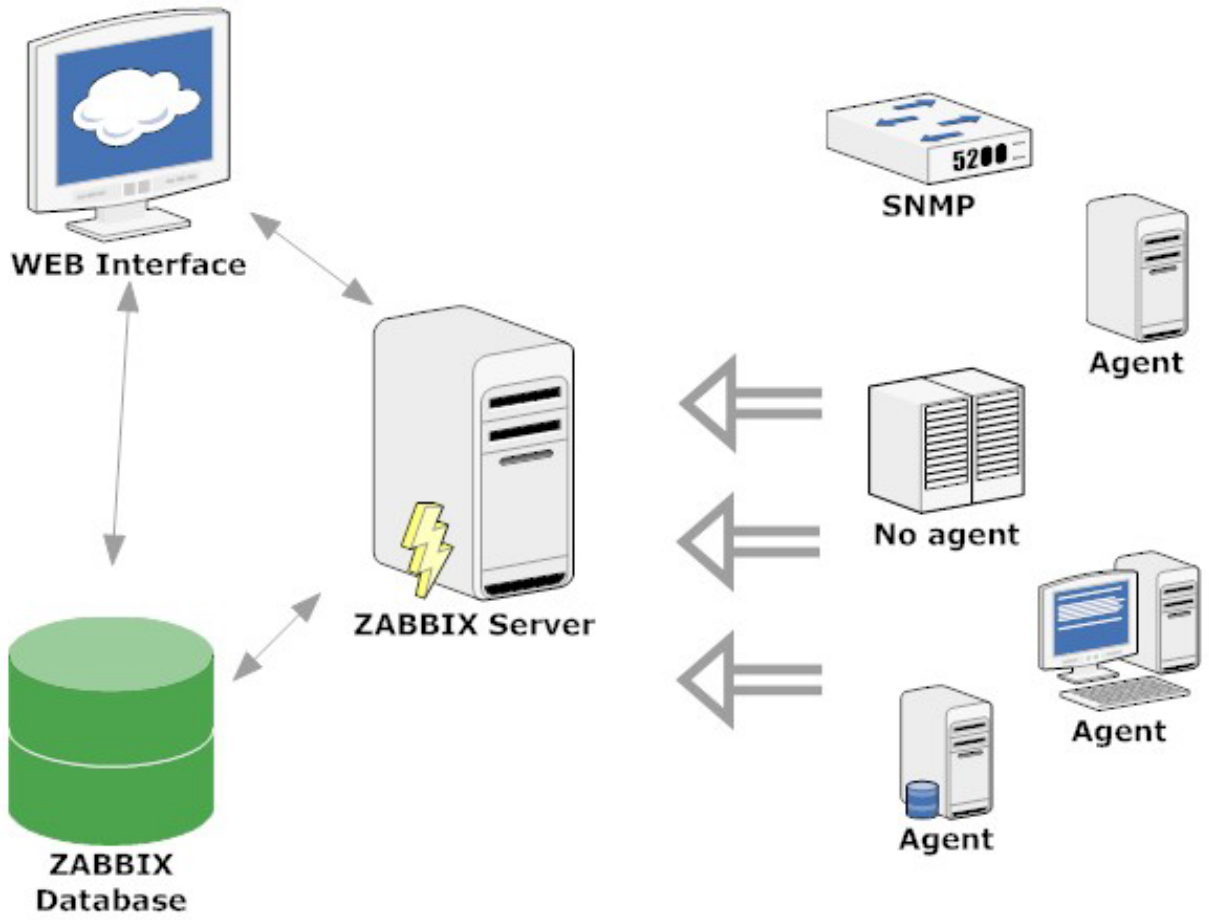
# Zabbix Server



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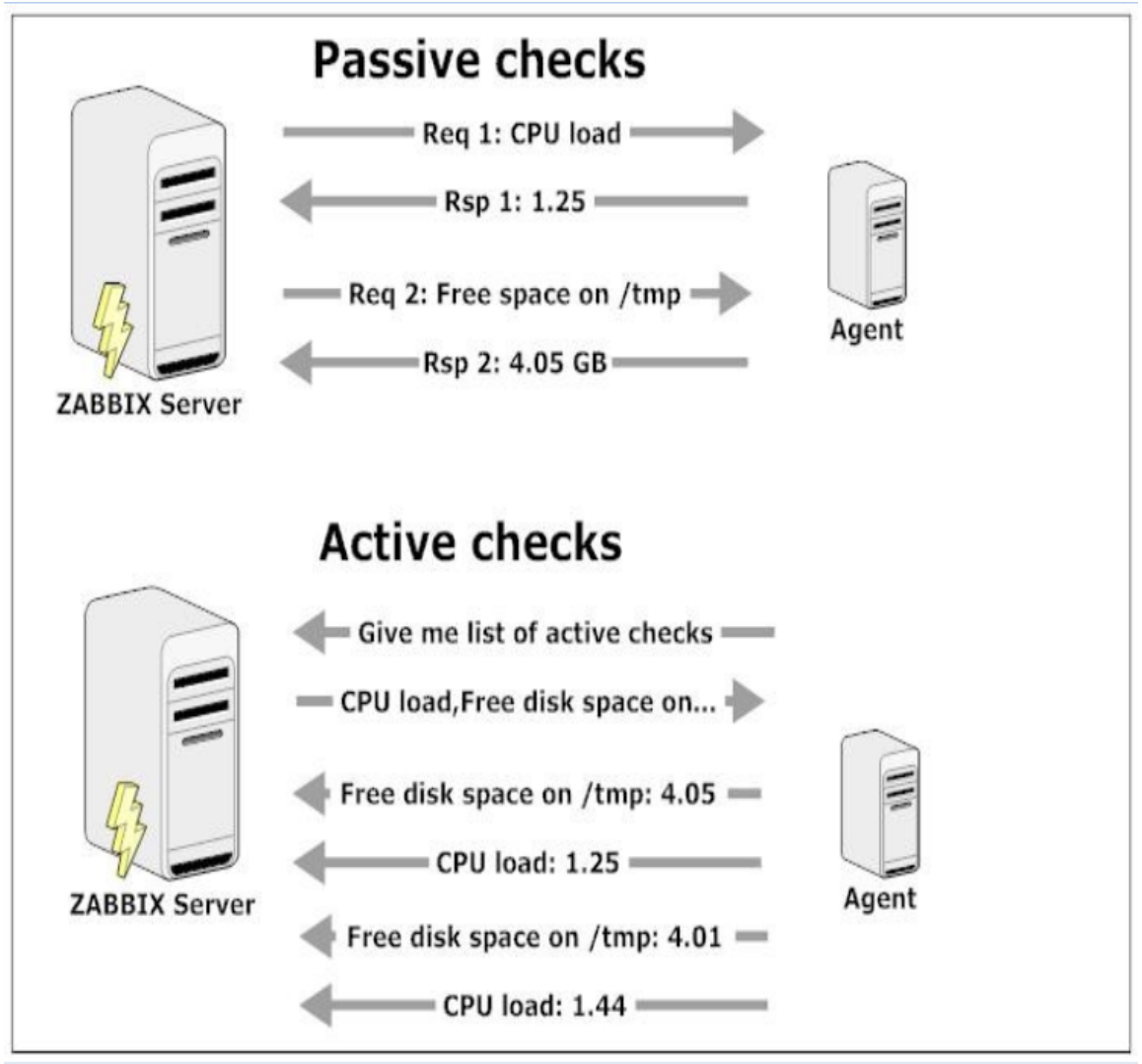
# Zabbix Agent



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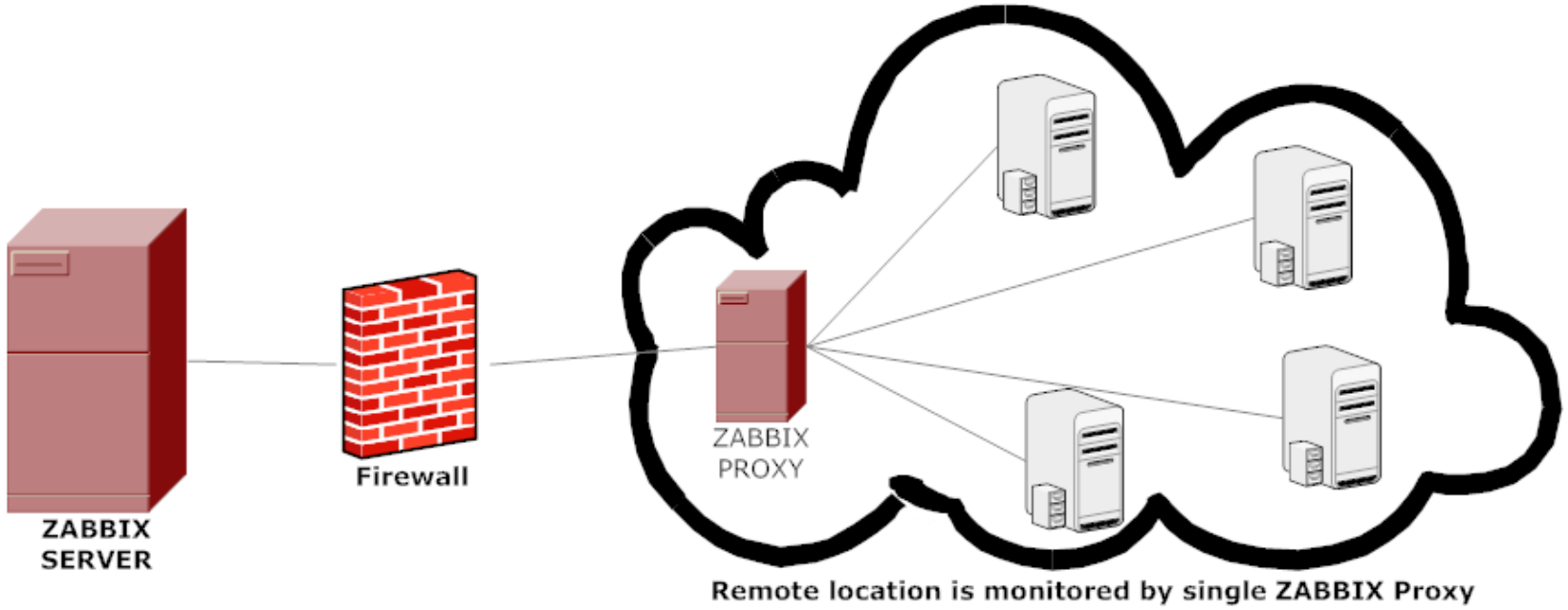
# Zabbix Proxy



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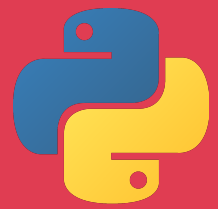
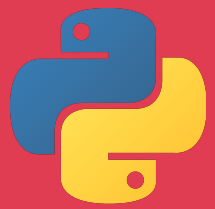
# Automation?

*Switched manual process that by human -> machine*

**Auto Detection** → **Auto Configuration** → **Generate Topology Map** → **Visualizing Network Topology** → Visualizing Network Traffic



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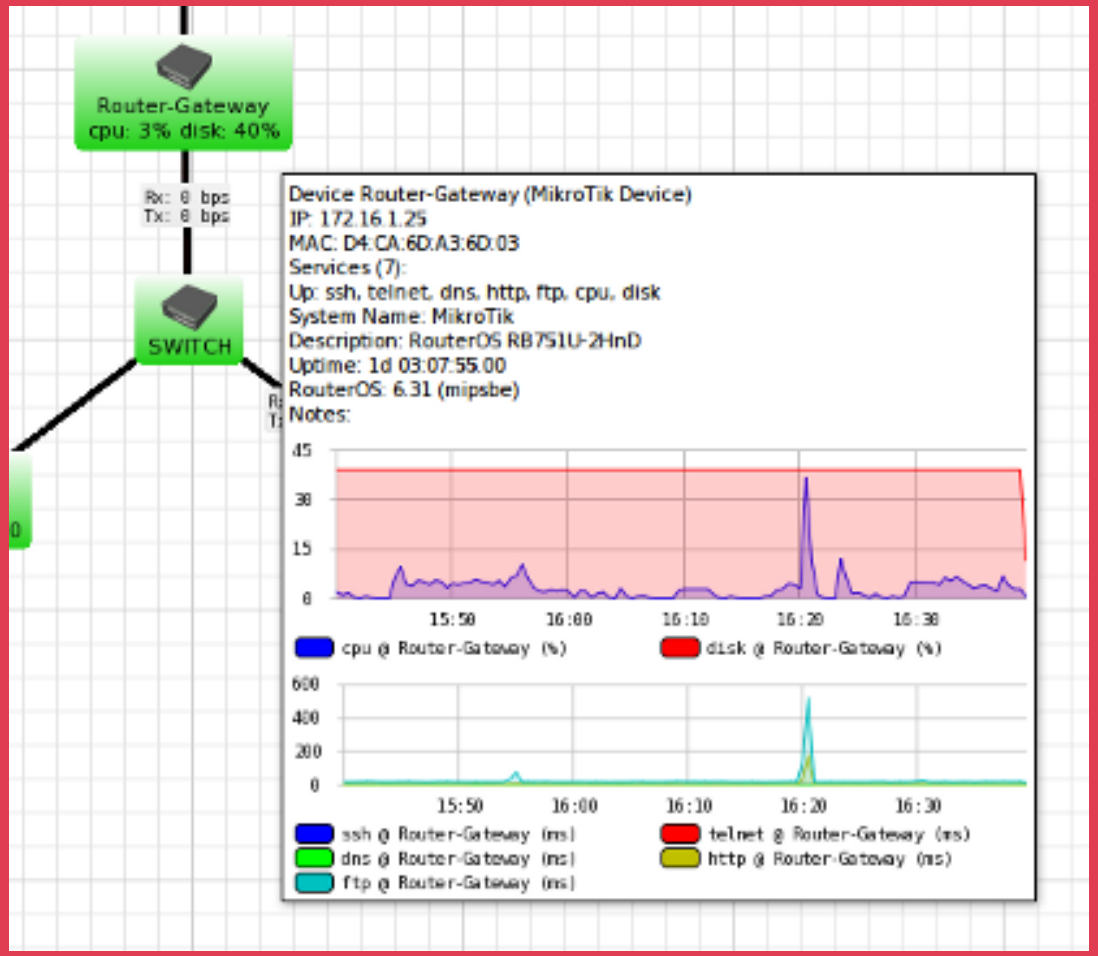
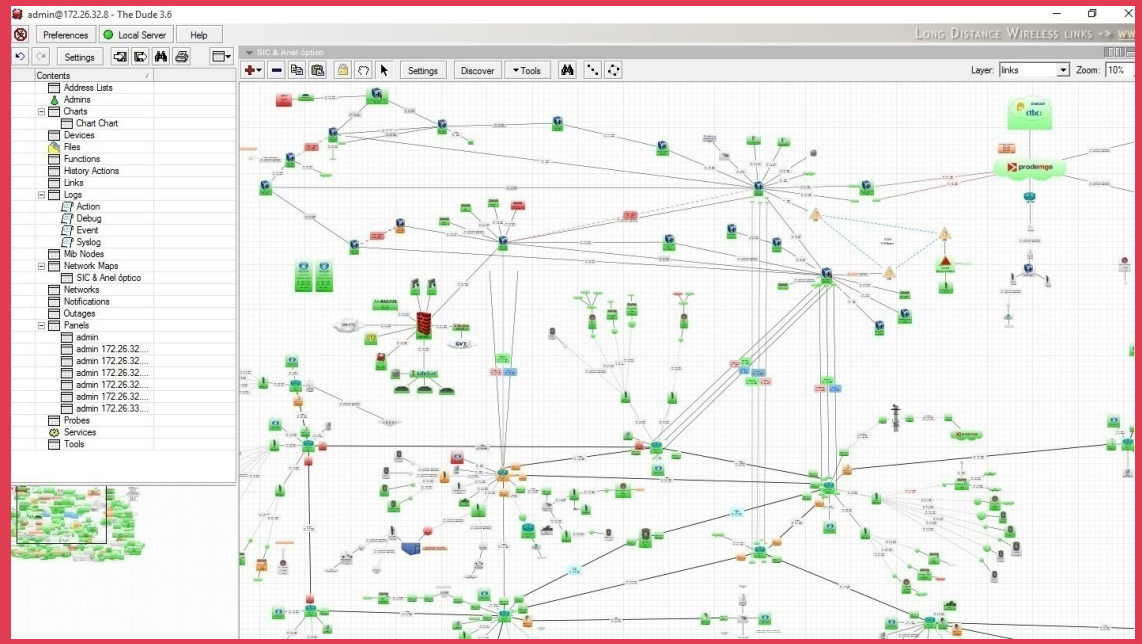
# NMS on MikroTik Product




The Dude MikroTik

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# Torch MikroTik!

Pages /... / Tools

## Torch

MikroTik Torch is a real-time traffic monitoring tool that can be used to monitor the traffic flow through an interface.

⚠ Traffic that appears in torch is before it has been filtered by a Firewall. This means you will be able to see packets that might get dropped by your Firewall rules.

```
[admin@MikroTik] > /tool/torch
```

You can monitor traffic classified by:

- source address (IPv4 and IPv6);
- destination address (IPv4 and IPv6);
- port;
- protocol;
- mac-protocol;
- VLAN ID;
- mac-address;
- DSCP;

MikroTik Torch shows the protocols you have chosen and the TX/RX data rate for each of them on the particular interface.

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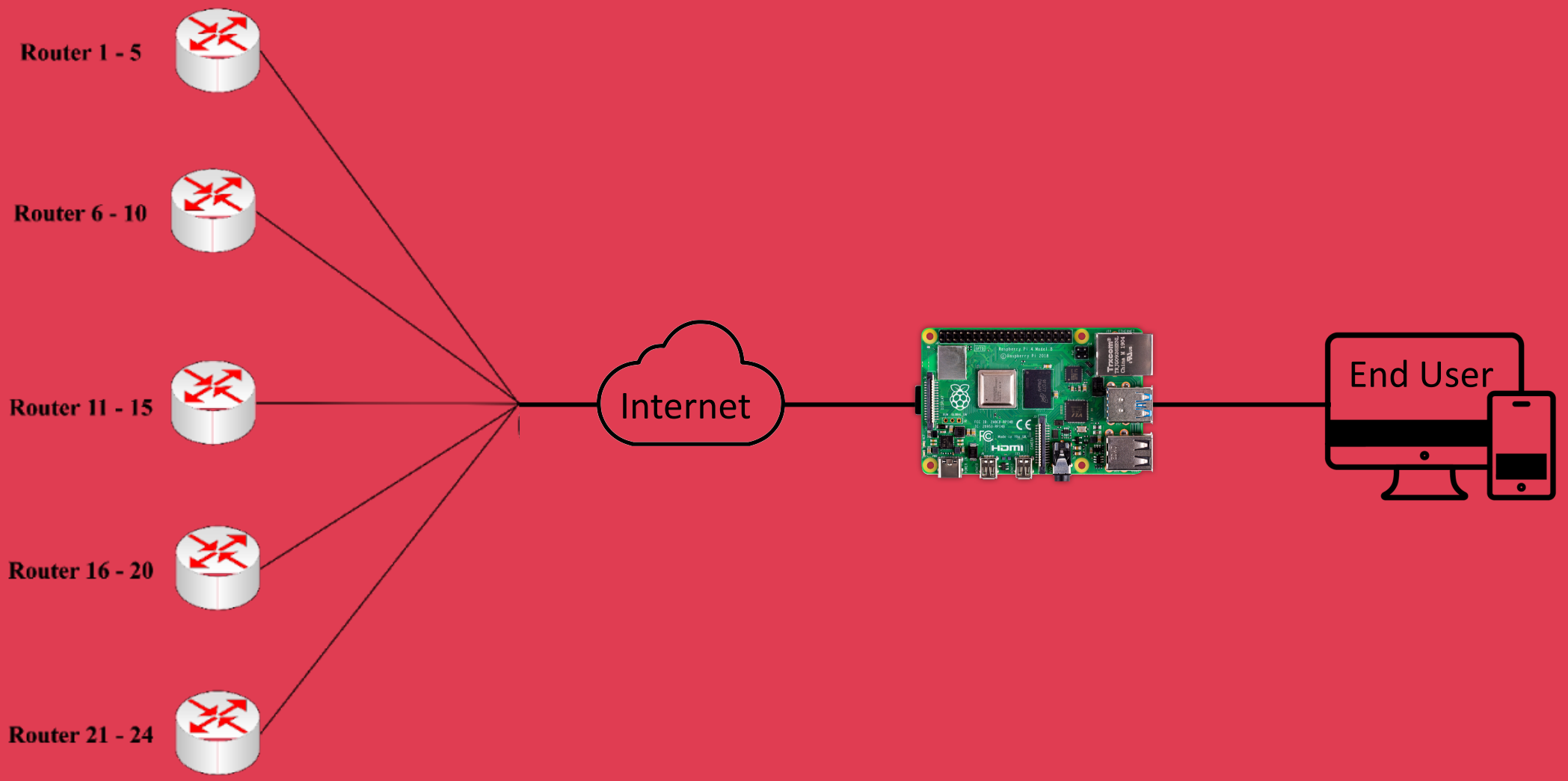
# NMS on MikroTik Product



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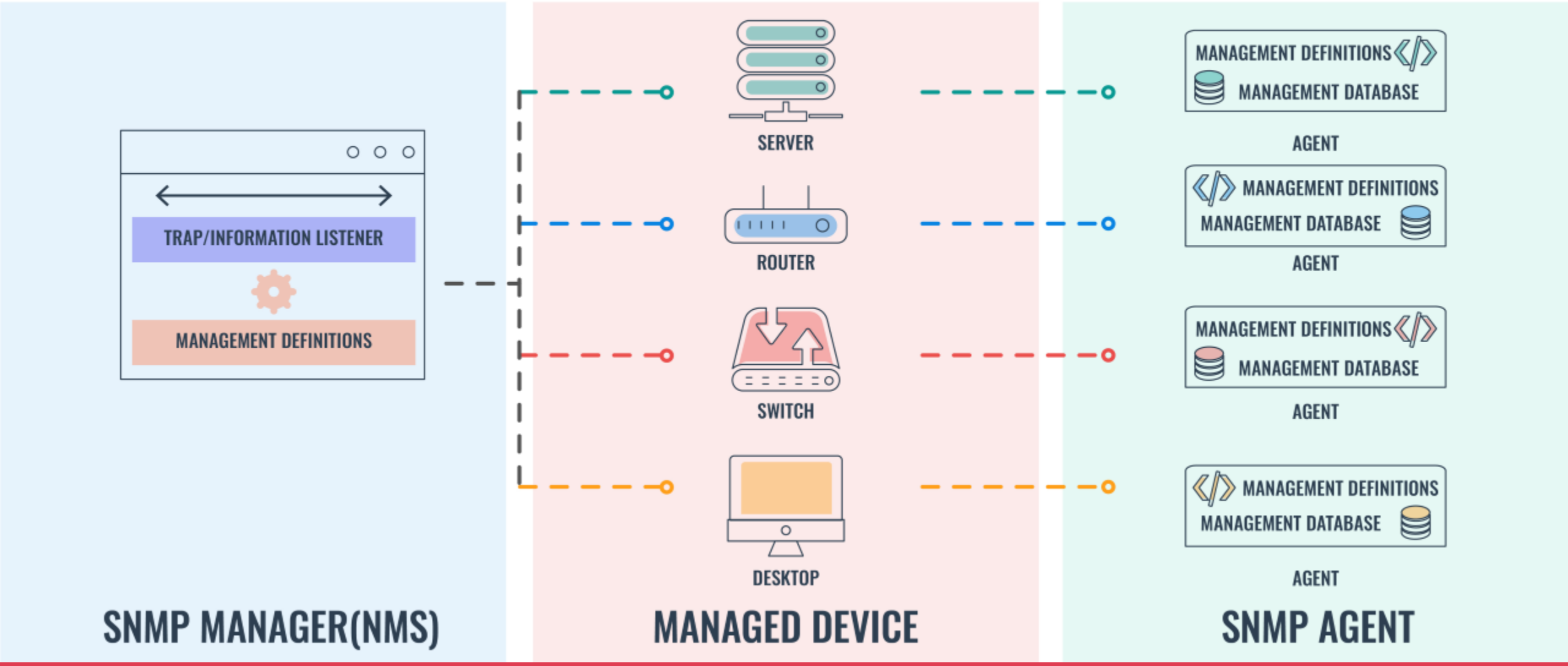
# SNMP Architecture



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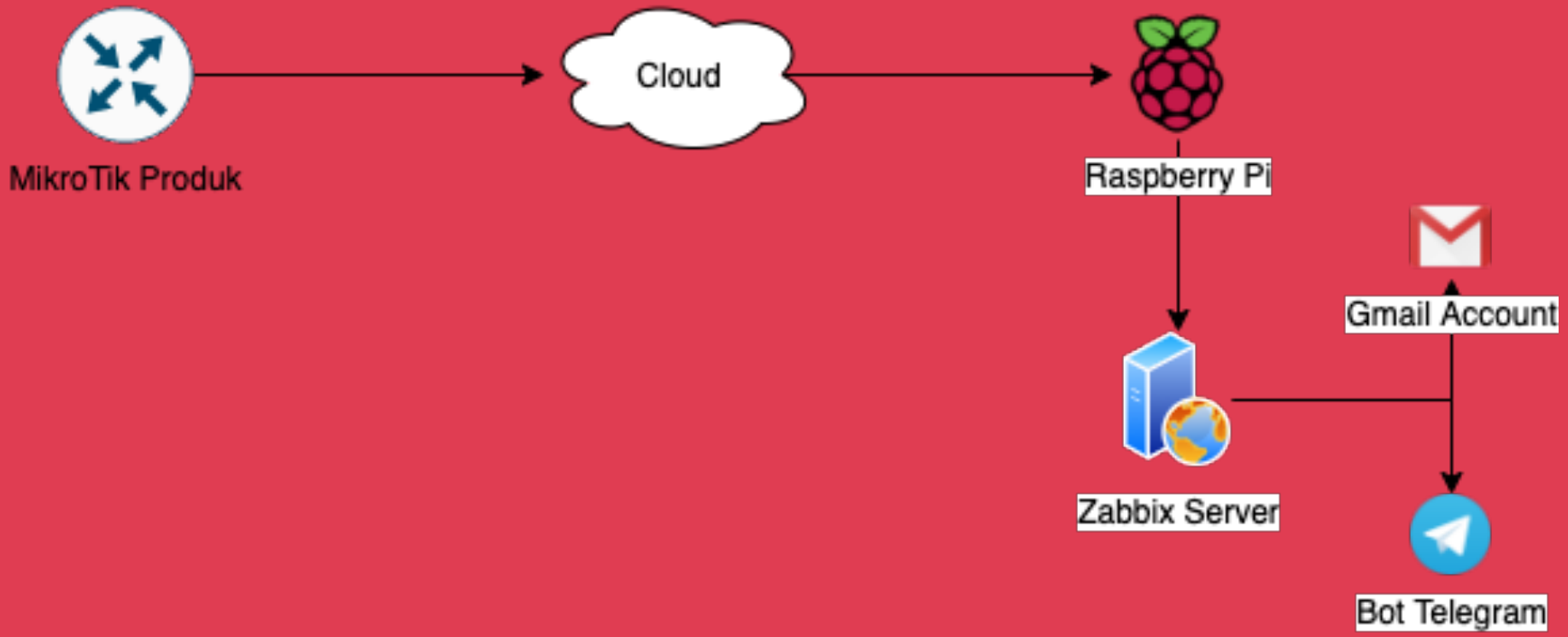
# Current Implementation




Router -> Raspberry Pi -> Email + Telegram

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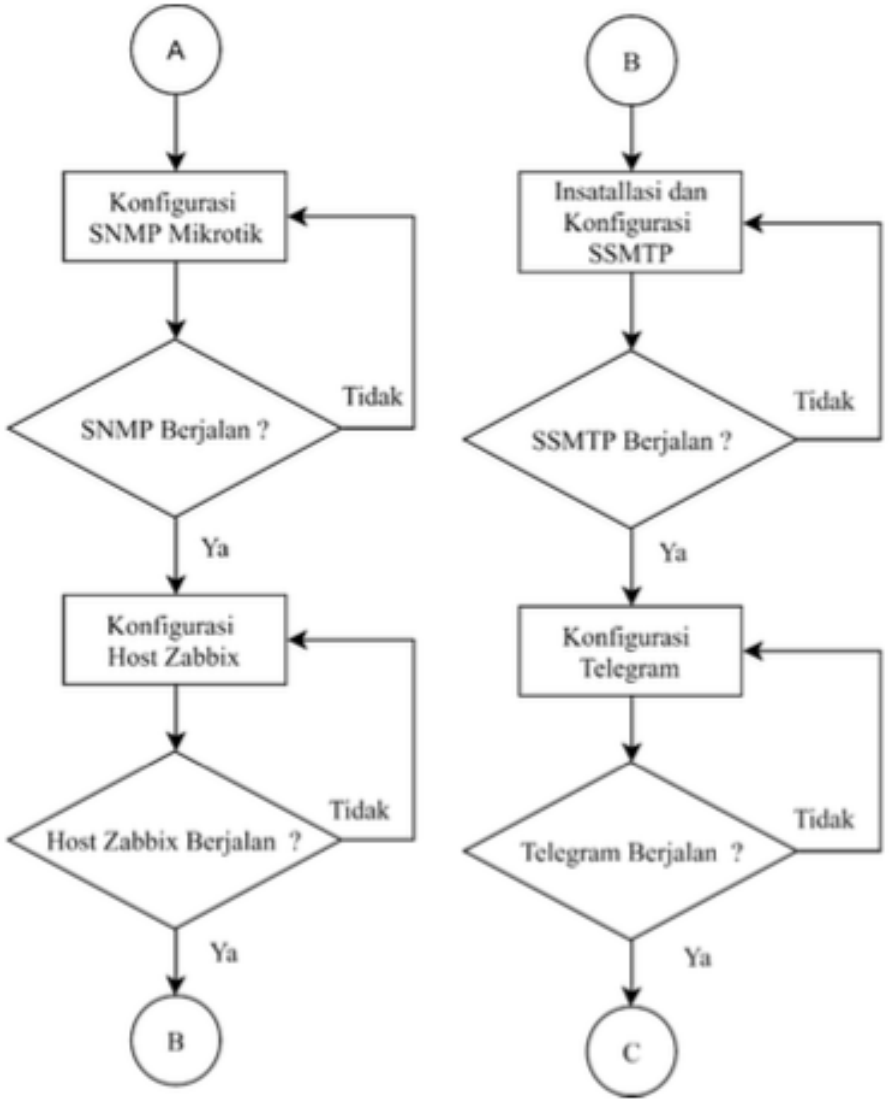
# IoT on MikroTik Product



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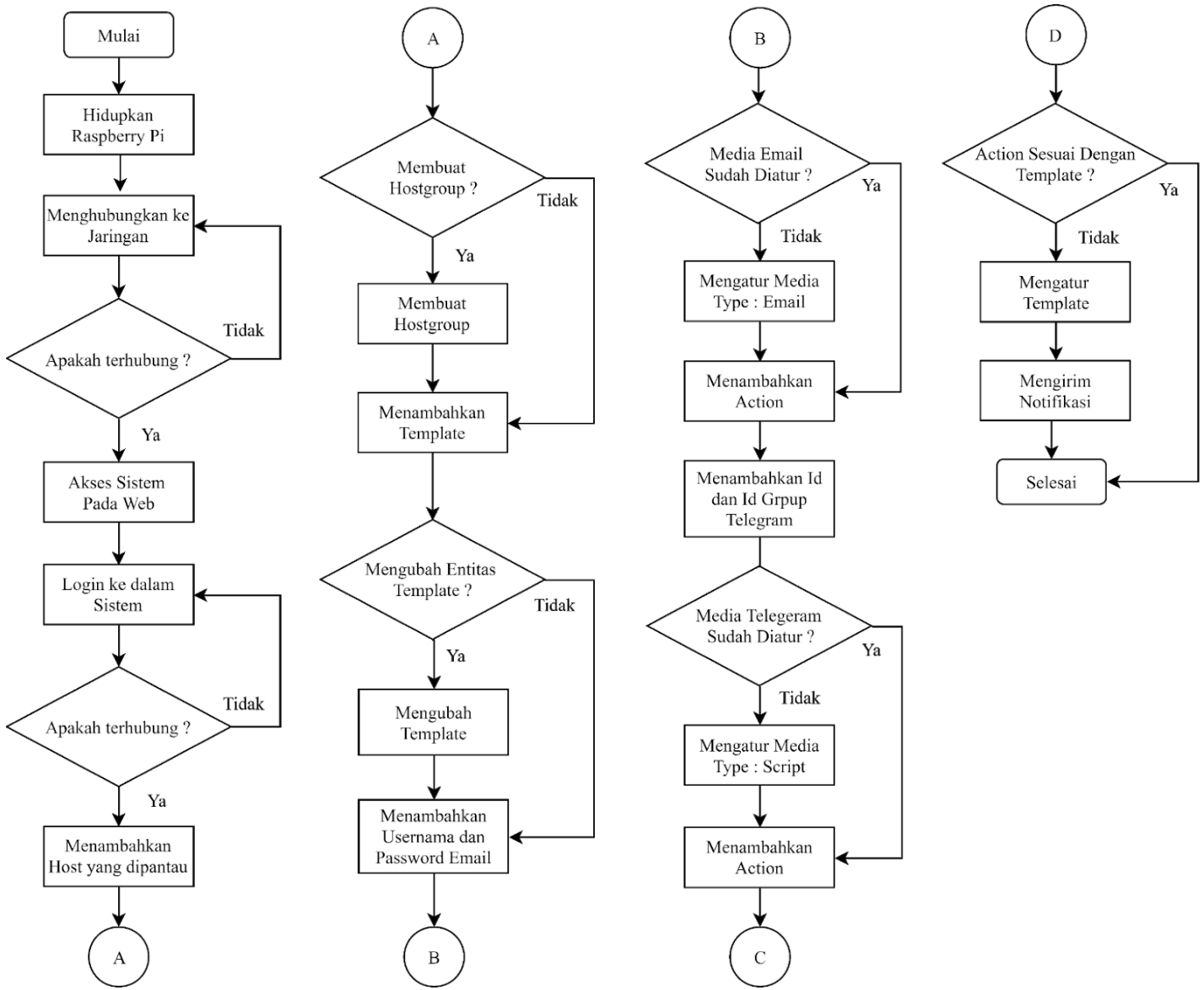
# IoT on MikroTik Product



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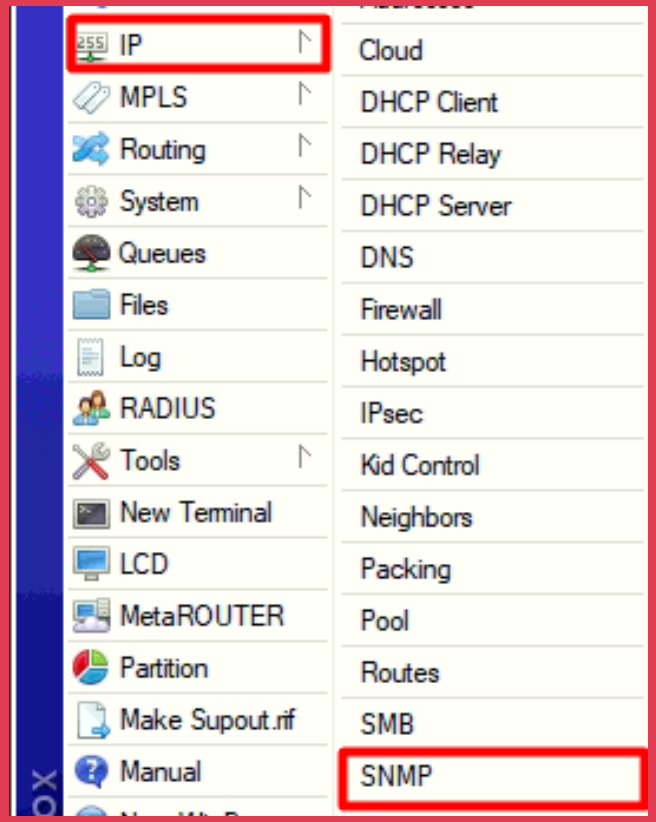
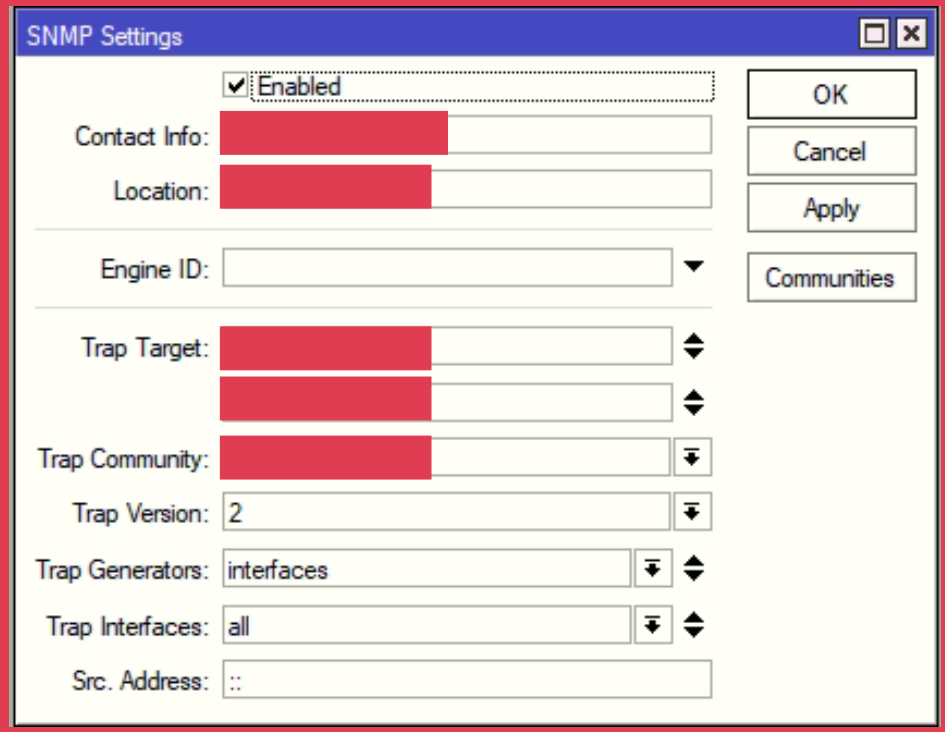
# SNMP Configuration



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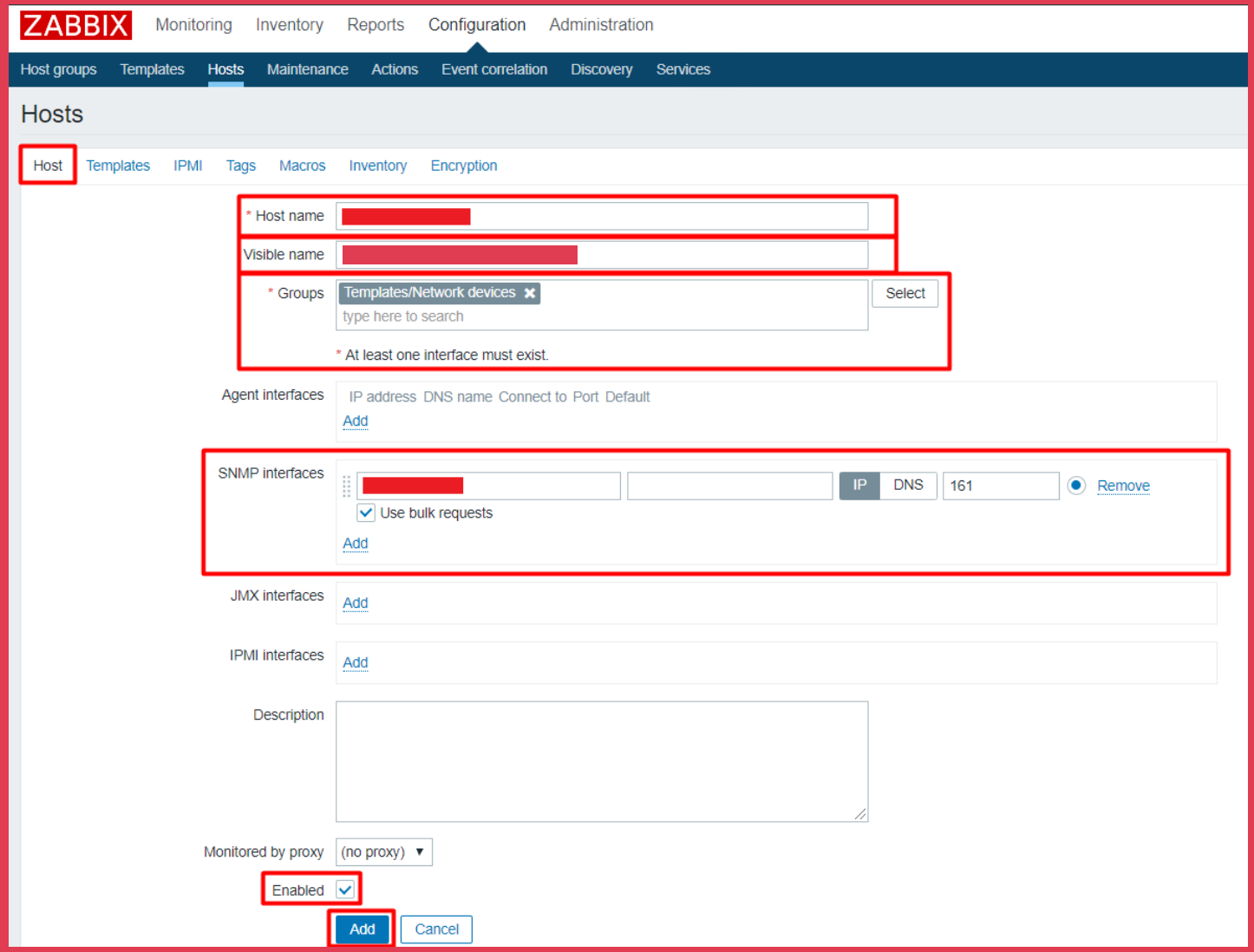
# Host Configuration



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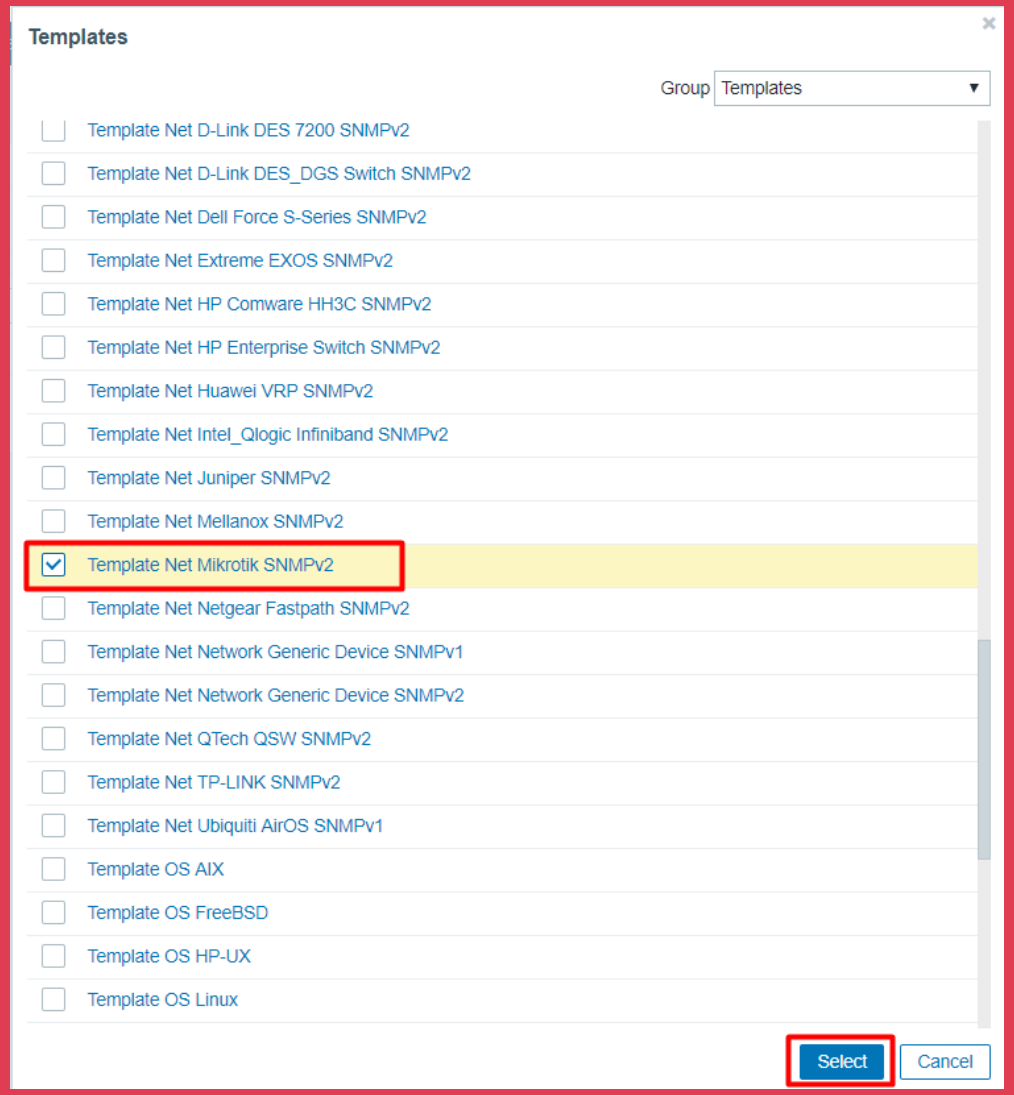
# MikroTik Template Conf



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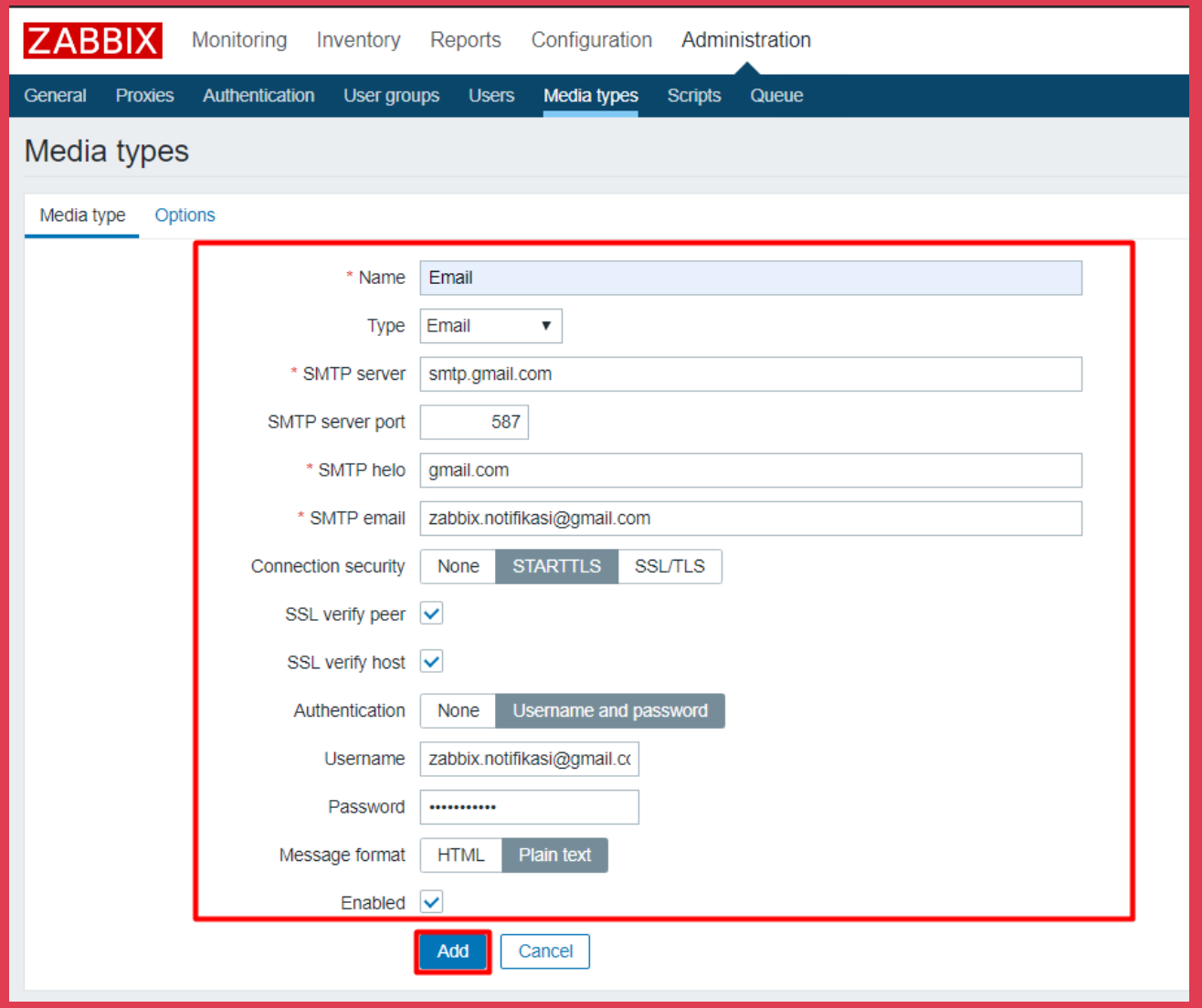
# SSMTP Configuration



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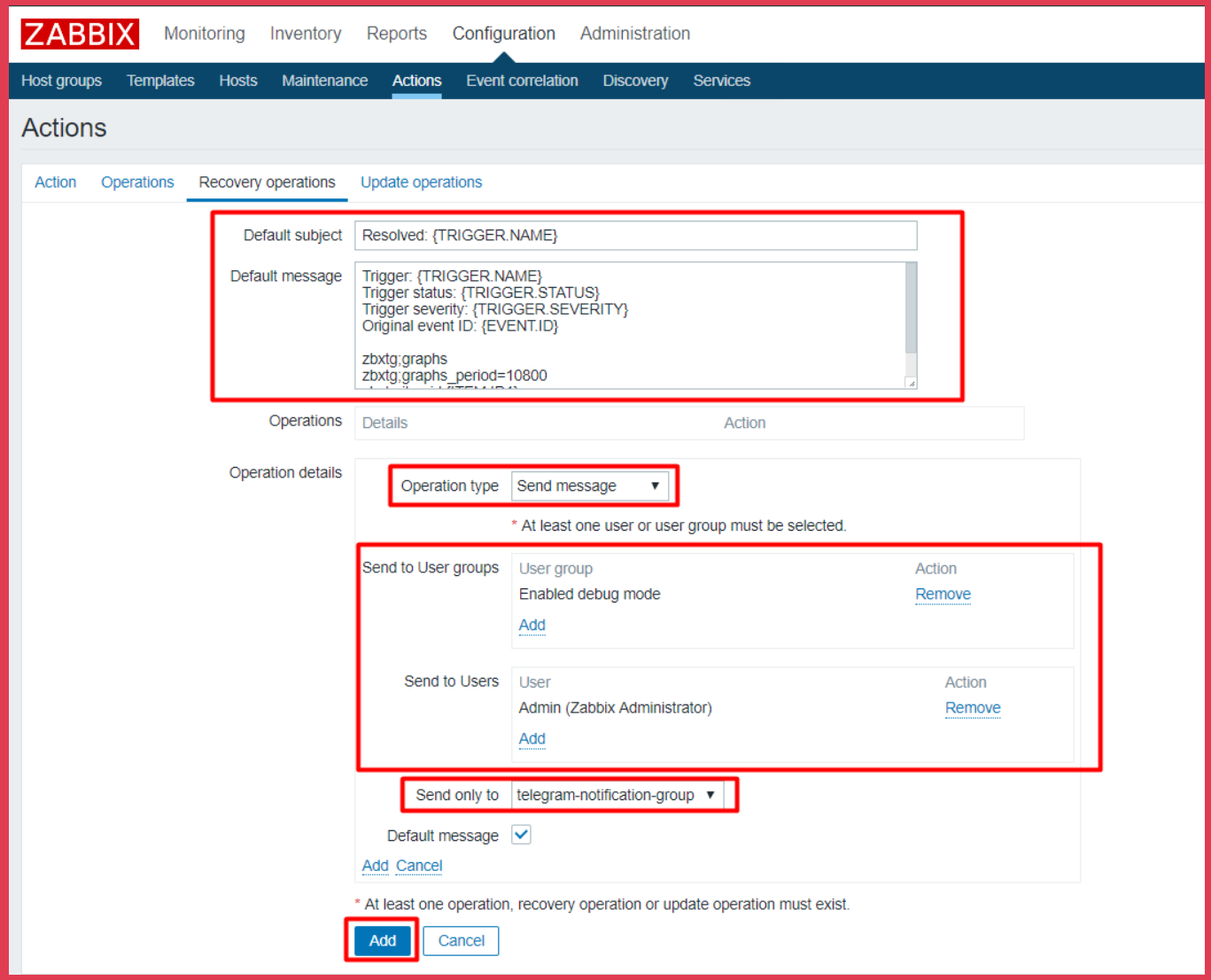
# Telegram Configuration



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# How we can get message from Zabbix?

A trigger may have the following status:

| VALUE | DESCRIPTION |
|---|---|
| OK | This is a normal trigger state. |
| PROBLEM | Normally means that something happened. For example, the processor load is too high. |

***OK** and **PROBLEM** parameters*

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# MikroTik Template

### Template Net Mikrotik SNMPv2 Featured Popular

Official templates for Mikrotik RouterOS devices. Please see Template Description and follow documentation link for more info.
Depends on: https://share.zabbix.com/official-templates/template-modules-pack Please download and import them first.

Category: Mikrotik

## Zabbix RouterOS BGP Monitoring Popular

For more details using this template, take a look at the repository

### RouterOS 6.x Popular

Review of monitoring item name Fix LLD rule multi core CPU CPU temperature Network interface [send, receive, error, discard, status] Storage Monitoring Power-comsuption, Power-current [can not be acquired with some Routerboards.] monitoring ...

Category: Mikrotik

Type Template Min Zabbix version 4.0.x

### Template Mikrotik RB750-RB1100 Popular

Template Mikrotik para RB 750 e RB1100. Zabbix 3.0

Category: Mikrotik

Type Template Min Zabbix version 3.0.x

### Mikrotik RouterOS v6.x - v3.0.x Popular

Working on all Mikrotik routers, but not all position are used by each router. Many of position like: 3.3 voltage 5 voltage 12 voltage Active fan Board temperature Core voltage CPU frequency CPU temperature Current DHCP leases Fan Speed 1 ...

Category: Mikrotik

Type Template Min Zabbix version 3.0.x

| Trigger |
| --- |
| High CPU utilization |
| Server has been restarted |
| Device: Temperature is above critical threshold: >60 |
| Device: Temperature is above critical threshold: >50 |
| Device: Temperature is too low: <5 |
| Device has been replaced (new serial number received) |
| Disk-131072: Disk space is critically low |
| Disk-131072: Disk space is low |
| Firmware has changed |
| High ICMP ping loss |
| High ICMP ping response time |
| High memory utilization |
| Interface wlan1(): Link down |
| Interface ether1(): Ethernet has changed to lower speed than it was before |
| Interface ether1(): High bandwidth usage >90% |
| Interface ether1(): High error rate |
| No SNMP data collection |
| Unavailable by ICMP ping |

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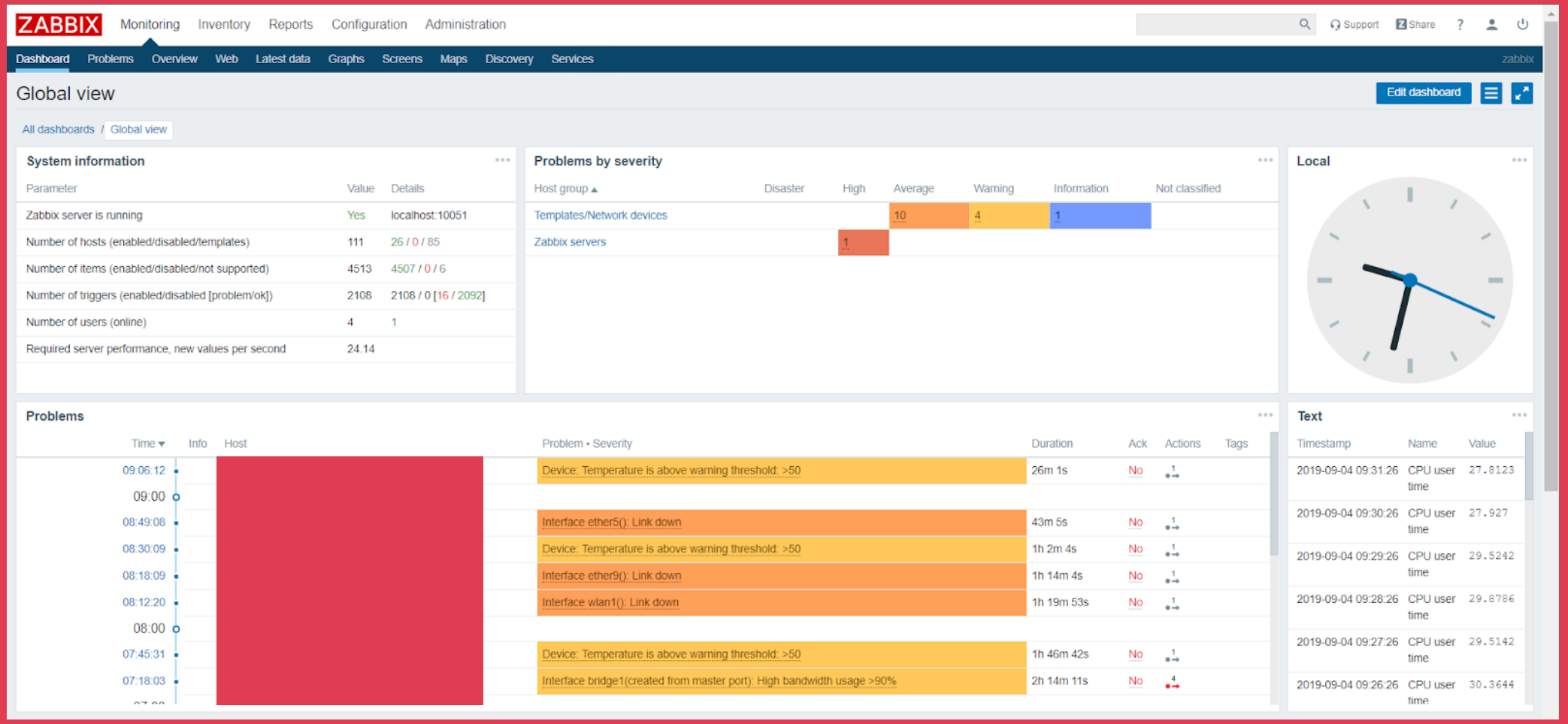
# Output NMS on MikroTik Product



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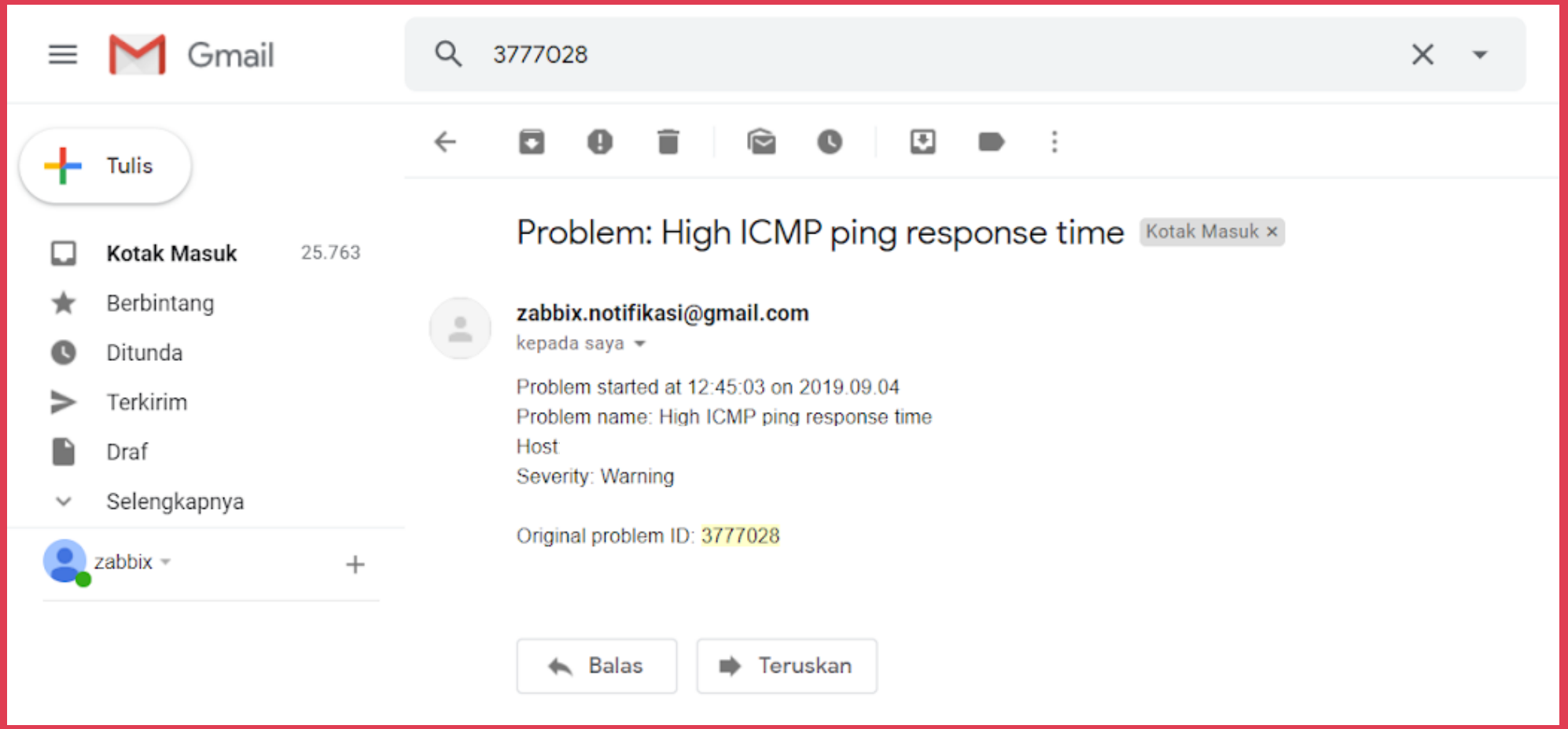

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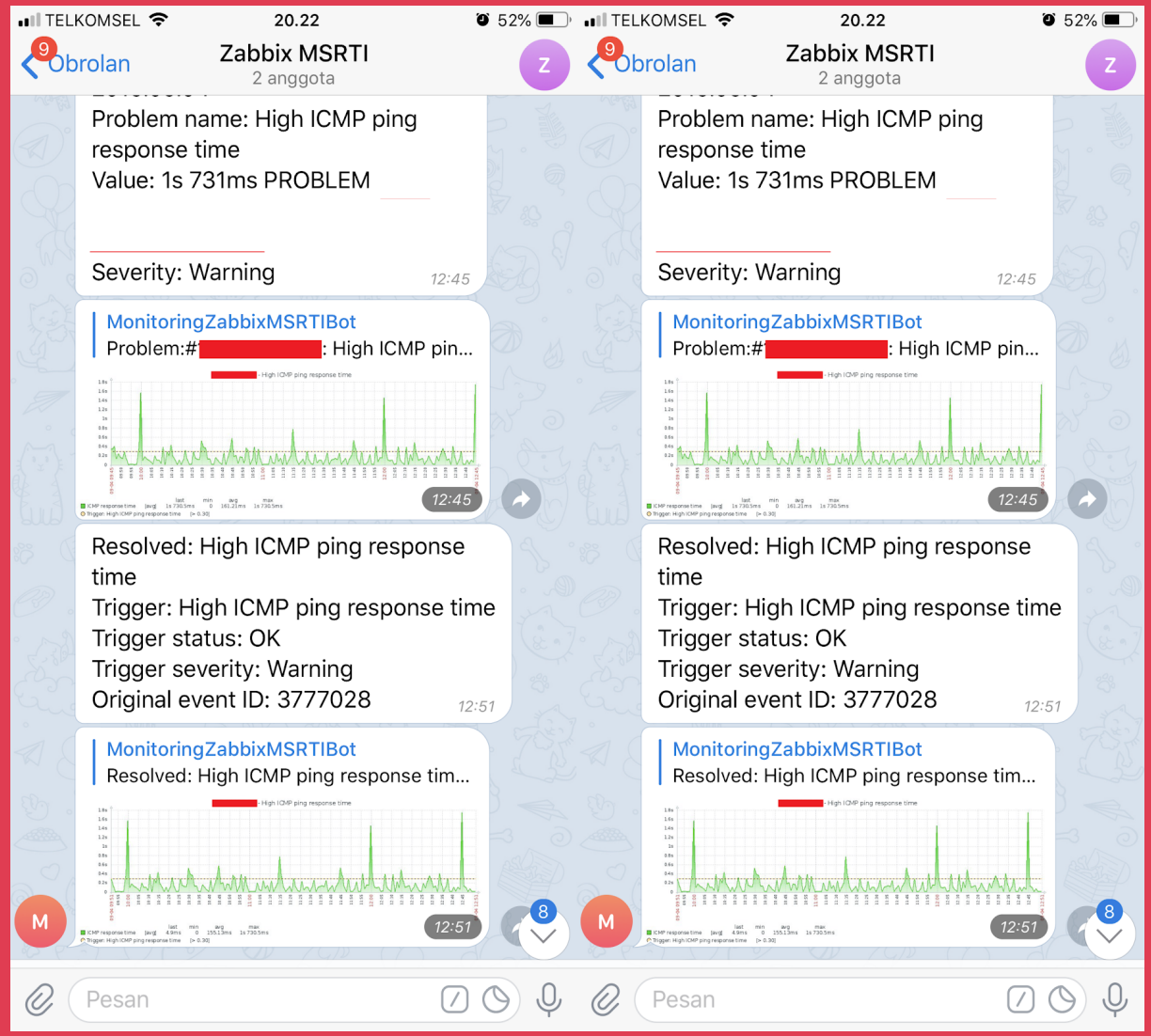

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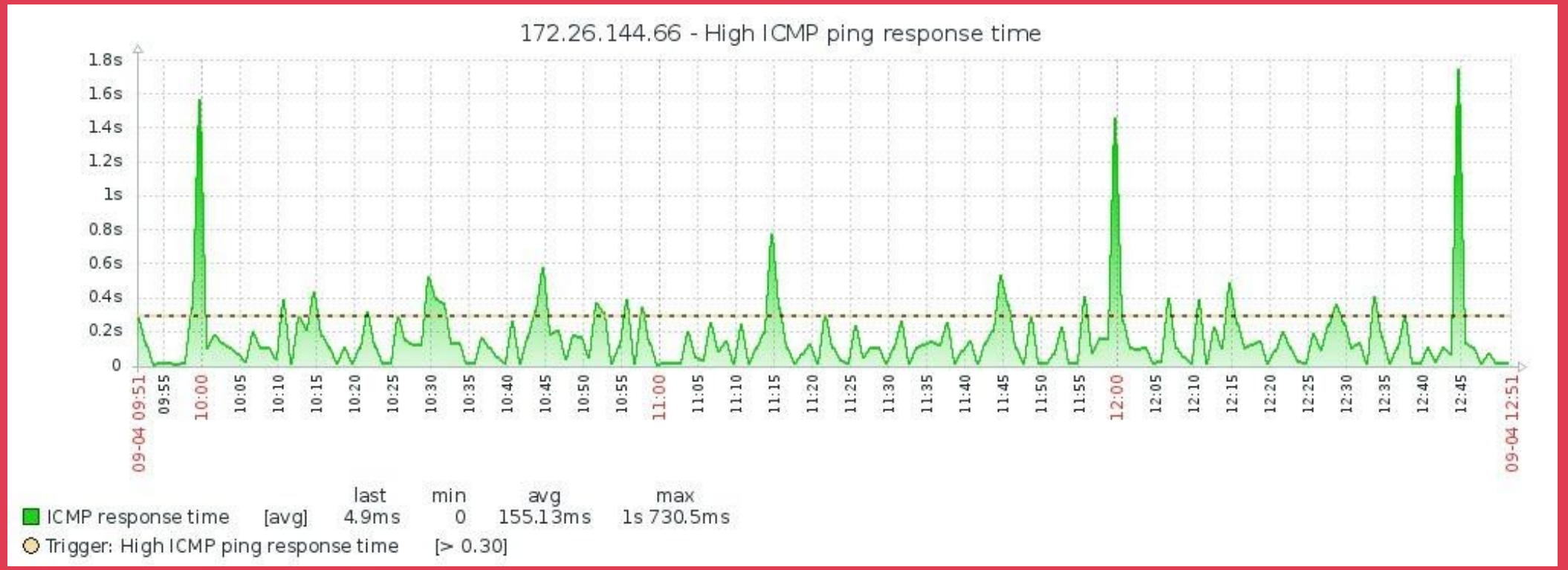
# Output NMS on MikroTik Product



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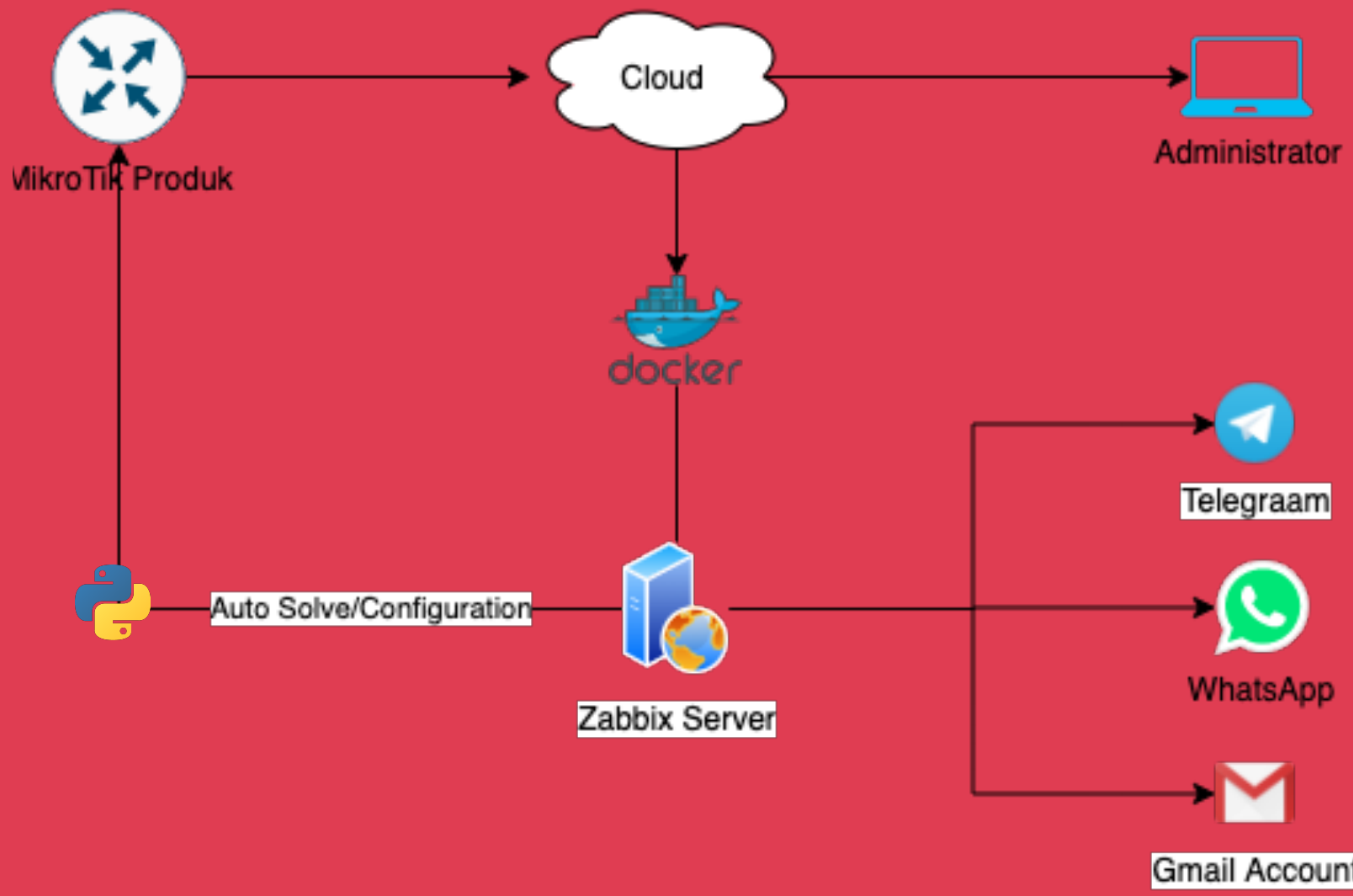
# Future Implementation



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# **Con:** Internet of Things and Automation in Networking

- Real time network monitoring system in Web App
- Network Monitoring System with low resources (Cloud, Microcontroller)
- Automation error/problem message trough Telegram and Google Mail
- Auto solve problem in the network using Python (machine learning)

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# Question and Answer?

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 linkedin.com/in/muhnandajr

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# Thank you!

Need training or B2B project contact me at **@nandajabarr**

www.diconfig.id @diconfig diconfigindonesia@gmail.com

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# References

- Telegram Notification https://git.zabbix.com/projects/ZBX/repos/zabbix/browse/templates/media/telegram/README.md
- Email Notification https://www.zabbix.com/documentation/current/manual/config/notifications/media/email