

# Mikrotik Automation using Scripting, SSH, & API

Ahmad Rosid Komarudin, TR0574  
Network Engineer & Trainer, ID-Networkers

# Introduction

# About ID-Networkers



Rofiq Fauzi, Oky Tria Saputra,  
Ikhwanul Kurnia Rahman, Farras  
Afif Perdana, Untung Wahyudi,  
Ahmad Rosid, Candra Milad Ridha  
Eislam / ID-Networkers

Rating: ★★★★★ 4.9/5 (1082 votes)

Average student result: 70%

**MTCNA, MTCRE, MTCWE, MTCTCE,  
MTCUME, MTCINE, MTCIPv6E**

West Jakarta, Indonesia

Tel: +62 21 4024 4024 / 0819 0819 1001

Write an e-mail



[www.idn.id](http://www.idn.id)



[info@idn.id](mailto:info@idn.id)

# About SMP & SMK IDN

SMP IT  
(Apps.Design.Web)



[READ MORE](#)

SMK RPL  
(Pemrograman)



[READ MORE](#)

SMK TKJ  
(Jaringan.Komputer)



[READ MORE](#)

# About IDNFoundation



## PENDAFTARAN PESANTREN IDN 2017

PESANTREN IDN MADINATUL ILMI JONGGOL



### MATERI & PENDAFTARAN

|  |  |
|--|--|
| <b>NETWORKING</b><br>CISCO, MIKROTIK, UBIQUITI, JUNIPER<br>SERTIFIKASI INTERNASIONAL                           | <b>PERSYARATAN</b><br>TIDAK MEROKOK, TIDAK PACARAN<br>USIA MAKSIMAL 20 TAHUN<br>LULUSAN SMK TKJ (NETWORKING SYSADMIN)<br>LULUSAN SMK RPL (ANDROID DEVI)<br>SANGGUP MENGIKUTI PENDIDIKAN 1 TAHUN<br>MENDAPATKAN IJIN OLEH ORANGTUA<br>MEMBAWA LAPTOP SENDIRI                                      |
| <b>PROGRAMMER ANDROID</b><br>ANDROID, WEB SERVICES,<br>FRONTEND, BACKEND, API<br>INTERNET OF THINGS, ARDUINO   | <b>PELAKSANAAN</b><br>14 OKTOBER 2017 - 14 OKTOBER 2018<br>MAKAN OLEH Masing-Masing SENDIRI<br>BIAYA PENDIDIKAN GRATIS<br>MENGINAP DISEDIAKAN GRATIS<br>TRAINING DISEDIAKAN GRATIS<br>MODUL BELAJAR DISEDIAKAN GRATIS<br>SANGGUP SHOLAT DIAWAL WAKTU DI MASJID<br>SANGGUP MENGIKUTI KAJIAN RUTIN |
| <b>SYADMIN</b><br>WINDOWS SERVER<br>LINUX SERVER<br>VIRTUALIZATION (VMWARE, HYPER-V)<br>CLOUD (OPENSTACK, AWS) | <b>CCIE</b><br>10 NOVEMBER MUSTI UJIAN WRITTEN<br>FOKUS BELAJAR LAB  |

**PENDAFTARAN**  
1 SEPTEMBER - 1 OKTOBER  
[WWW.IDNFOUNDATION.ORG/DAFTAR](http://WWW.IDNFOUNDATION.ORG/DAFTAR)  
SELEKSI : 1 SEPT - 1 OKT 2017  
PENGUMUMAN : 4 OKTOBER  
INFORMASI : 087788 567782

FB.COM/GROUPS/IDNFOUNDATION    IDNFOUNDATION.ORG    087788 567782

# About IDNFoundation



## TRAINING NETWORKING GRATIS GURU SMK TKJ ANGGKATAN 19

IDN BOARDING SCHOOL JONGGOL, KAB BOGOR, 19-24 NOVEMBER, 8 PAGI - 12 MALAM

### MATERI BELAJAR

1. CISCO CCNA DARI 2.5JT --> GRATIS
2. MIKROTIK MTCNA+EXAM DARI 2JT --> GRATIS
3. MIKROTIK MTCRE+EXAM DARI 2.5JT --> GRATIS
4. NETWORK MANAGEMENT SYSTEM DARI 2JT --> GRATIS
5. SUBNETTING COMPETITION
6. SUPERLAB COMPETITION
7. MIKROTIK ACADEMY

- KHUSUS GURUR SMK TKJ SAJA
- TRAINING GRATIS, MAKAN OLEH MASING2
- MEMBAWA MIKROTIK ROUTERBOARD SENDIRI2
- PENGINAPAN GRATIS ALA KADARNYA
- TIDAK ADA SERTIFIKAT KEHADIRAN
- INFORMASI WA 0877 2003 2010

### CARA PENDAFTARAN :

1. JOIN GROUP IDN ANGGKATAN 19 : [s.id/idn19](https://www.facebook.com/s.id/idn19)
2. KIRIM SURAT TUGAS KE GROUP
3. KIRIM SURAT PERNYATAAN AKAN MENGAJARKAN KEMBALI KE GURU LAIN DI GROUP
4. KIRIM BUKTI TRANSFER 300RB KE BNI SYARIAH 500-100-664 AN YAYASAN IDN KE GROUP

SUPPORTED BY :



**ID-Networkers**  
INDONESIAN EXPERT FACTORY

# About SMKN 1 Nglegok, Blitar



**PERINGKAT JUARA  
OLIMPIADE JARINGAN 2018**

**JUARA 1  
SMK NEGERI 1 NGLEGOK  
JAWA TIMUR**

**JUARA 2  
SMK TELKOM MALANG  
JAWA TIMUR**

**JUARA 3  
SMK N 1 KADEMANGAN  
JAWA TIMUR**

# What are we going to talk about?

- Introduction to Network Automation
- General problem
- How to solve it
- Mikrotik scripting
- Python for networking
- SSH vs API
- **DEMO TIME!!!**





# Introduction to Network Automation

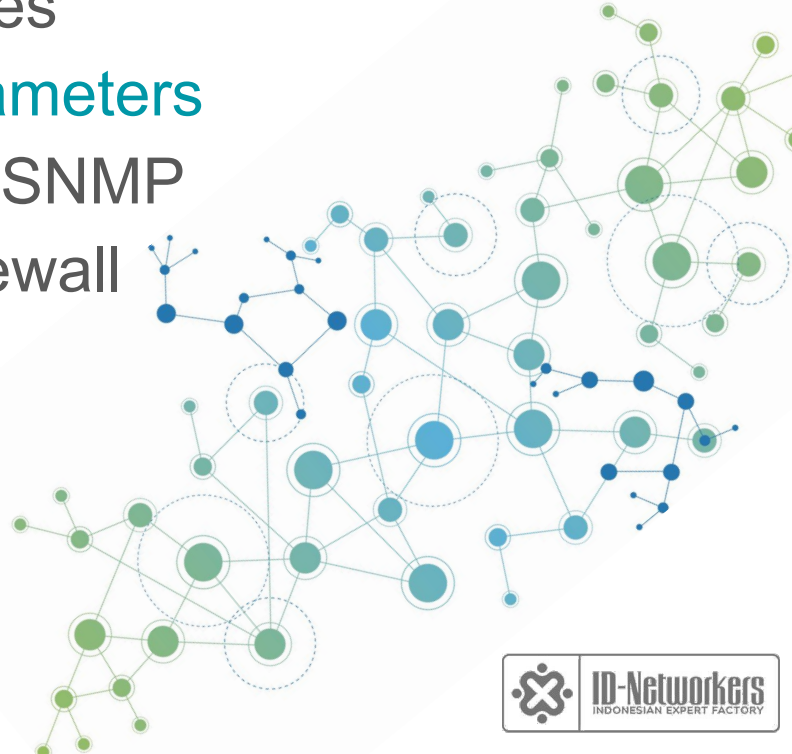
- Network Automation is a methodology in which software **automatically configures, provisions, manages and tests** network devices



# General Problem

# General Problem

- We have thousand mikrotik devices
- We need to **configure identik parameters** in all of mikrotik devices, such us SNMP community, ipsec parameters, firewall rule, basic security, etc



# General Problem

- Need **many peoples** work together in a few days to configure thousand of devices.
- Need to **pay extra** for many peoples who doing that job



# General Problem

- **Human error** is a big enemy

*Lhoooo Kenopo iki router  
ku gak iso di remot???*

*Whoalahhhh... iki lho firewall mu kleru!!!*



# General Problem

- Miscommunication is daily habit

```
[admin@CoreIDNBaru] > user print
Flags: X - disabled
#  NAME
0  ;;; system default user
   admin
1  user1
```

*Kelakuane sopo to iki nambah  
user sak karepe dewe?????*

*Sopo meneh lek uduk bocah  
kae!!!*

# General Problem

- People will feel bored when doing **repetitive jobs**. When People bored, the jobs will **not completed perfectly**



*Iki kerjoan kapan entek e!!!*

# General Problem

- Non standard configuration

Interface public e iku  
ether1!!!



Jarene wingi ether5??  
Gelut wae yo!!!





**Solution!!!**

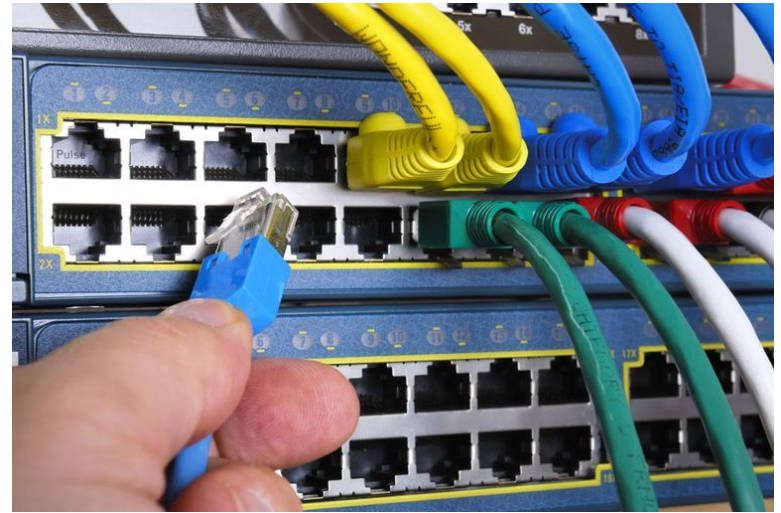
# Solution

- Computer can **doing repititive jobs without feel bored**, and the result will be perfect!



# Solution

- We don't need configure each devices manually, computer will do that! We should **focus on jobs that can't solved by computer**



# Mikrotik Scripting

- Used to automate simple stuff in single router

```
MMM      MMM      KKK
MMMM     MMMM     KKK
MMM MMMM  MMM  III  KKK  KKK  RRRRRR      000000      TTT      III  KKK  KKK
MMM  MM  MMM  III  KKKKK  RRR  RRR  000  000      TTT      III  KKKKK
MMM      MMM  III  KKK  KKK  RRRRRR      000  000      TTT      III  KKK  KKK
MMM      MMM  III  KKK  KKK  RRR  RRR      000000      TTT      III  KKK  KKK
```

MikroTik RouterOS 5.21 (c) 1999-2012

<http://www.mikrotik.com/>

# Mikrotik Scripting (example)

- Configure simple queue for target-address 192.168.1.100-192.168.1.200

```
:local x
:for x from 100 to 200 do={/queue simple
add target-address="192.168.1.$x"}
```

# Python for Networking

- Used to automate advanced stuff in multiple router
- Easy to Learn



# Python for Networking (example)

- Configure multiple queue in multiple router

```
ip_address = ["192.168.99.1", "192.168.99.2", "192.168.99.3"]
```

```
for ip in ip_address:  
    ssh.connect(hostname=ip, username=user, password=passw)  
    for x in range(100,200):  
        ssh.exec_command("queue simple add target="192.168.1.%s" % x)
```

# SSH vs API



# SSH vs API



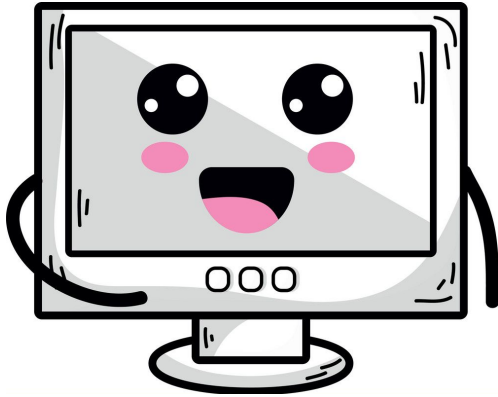
```
[admin@Mikrotik] > ip firewall nat print
Flags: X - disabled, I - invalid,

0      ;;; masquerade hotspot network
      chain=srcnat action=masquerade
      src-address=10.10.10.0/24

1      ;;; masquerade hotspot network
      chain=srcnat action=masquerade
      src-address=10.10.10.0/24
```

SSH is a **human language**, we happy to look the display like that. But computer don't! Computer like display with “key” & “value” pair

# SSH vs API



```
{  
  "chain": "srcnat",  
  "packets": 0,  
  "bytes": 0,  
  ".id": "*12",  
  "invalid": false,  
  "dynamic": false,  
  "action": "masquerade",  
  "src-address": "10.10.10.0/24"  
}
```

API is a **computer language**, Computer like display with “key” & “value” pair.

# Automation using SSH

```
import paramiko
from getpass import getpass

ip_address = ["192.168.99.1", "192.168.99.2", "192.168.99.3"]

user = raw_input("Input username: ")
passw = getpass()
...

for ip in ip_address:
    ssh.connect(hostname=ip, username=user, password=passw)
    stdin, stdout, stderr = ssh.exec_command("ip address print")
    print stdout.read()
```

# Automation using SSH



```
$ python mikrotik_ssh.py
```

```
Flags: X - disabled, I - invalid, D - dynamic
# ADDRESS NETWORK INTERFACE
0 192.168.99.1/24 192.168.99.0 ether4
```

```
Flags: X - disabled, I - invalid, D - dynamic
# ADDRESS NETWORK INTERFACE
0 192.168.99.2/24 192.168.99.0 ether1
```

```
Flags: X - disabled, I - invalid, D - dynamic
# ADDRESS NETWORK INTERFACE
0 192.168.99.3/24 192.168.99.0 ether3
```

# Automation using API

```
from librouteros import connect
from getpass import getpass
import json

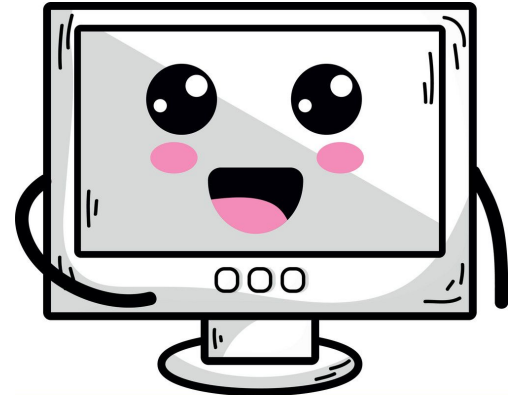
ip_address = ["192.168.99.1", "192.168.99.2", "192.168.99.3"]

user = raw_input("Input username: ")
passw = getpass()

for ip in ip_address:
    api = connect(username=user, password=passw, host=ip)
    ip_info = api(cmd="/ip/address/print")
    print json.dumps(ip_info, indent=3)
```

# Automation using API

```
$ python mikrotik_api.py
[
  {
    "network": "192.168.99.0",
    "dynamic": false,
    "invalid": false,
    "disabled": false,
    "actual-interface": "ether4",
    ".id": "*1",
    "address": "192.168.99.1/24",
    "interface": "ether4"
  }
]
```



# Use Case

# Use case

- Security Vulnerability
  - Change Password
  - Change Winbox Port
  - Disable Unused Services
  - Setting Allowed from on Services

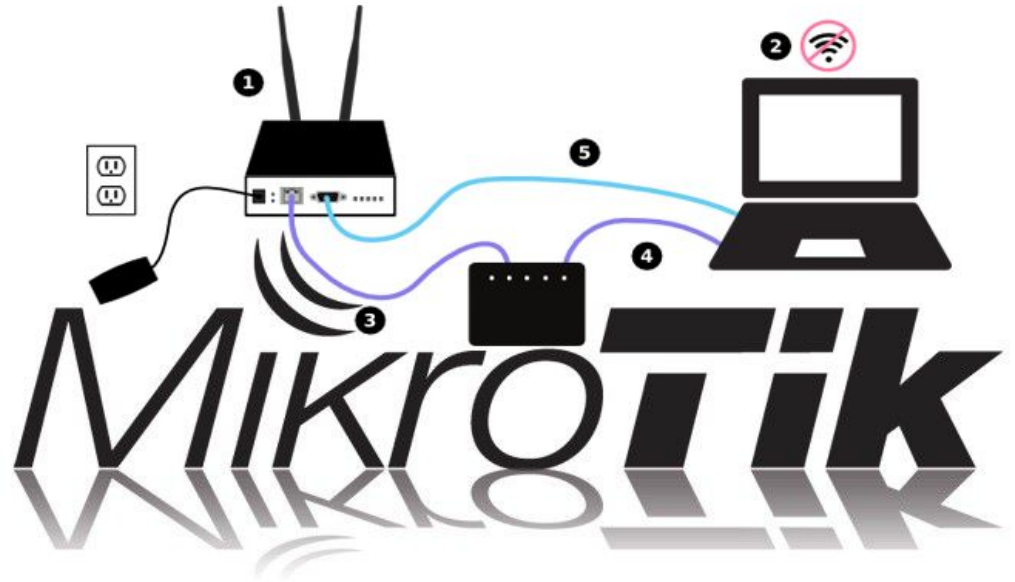




# Use case

- Setup new customer in ISP

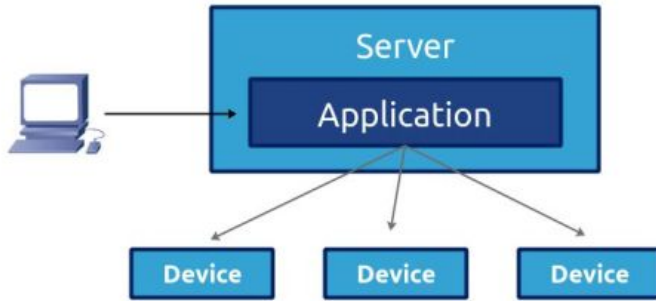
- Same private IP
- Same firewall rule
- Same NAT rule
- Same security rule



# Hard Work vs Smart Work

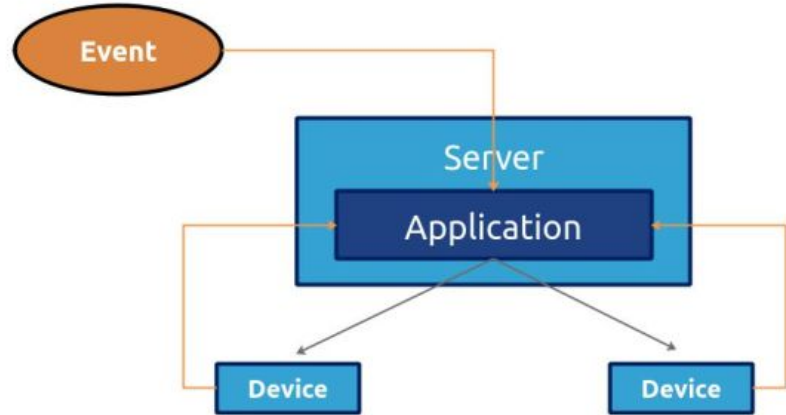


# Network Automation Type



## Proactive

- Manual Change
- Change by human



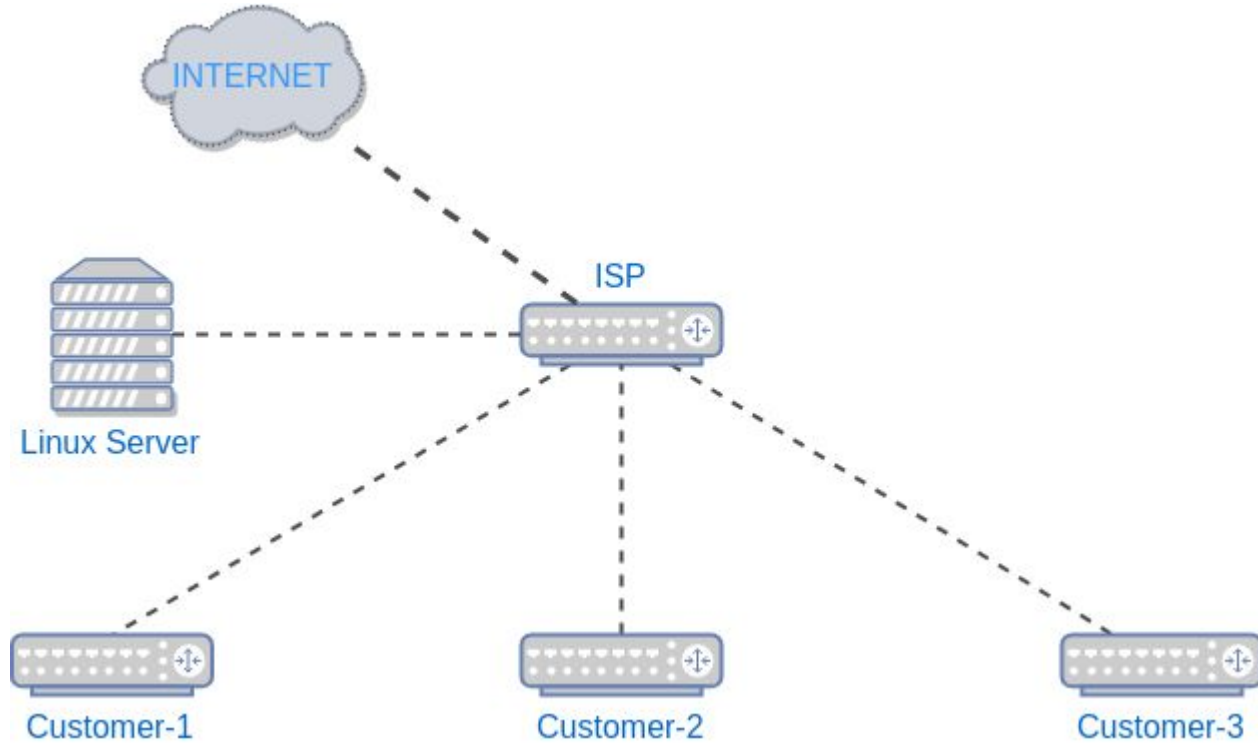
## Reactive

- Change by event
- Device send information to server

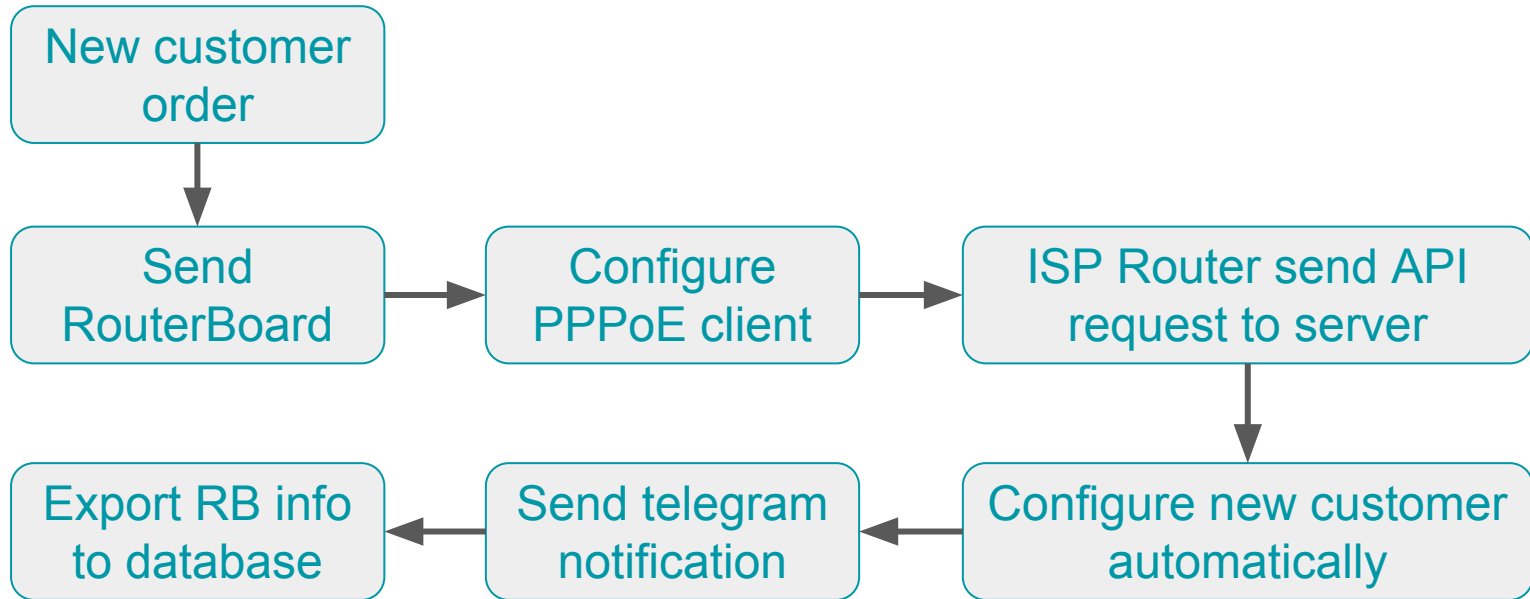
Image Source: EN-SDN Slide by Zufar Dhiyaulhaq

Demo Time

# Topology



# Flow Chart



Question?

# Further Reading

- Mikrotik Scripting  
<https://wiki.mikrotik.com/wiki/Manual:Scripting>
- Mikrotik API  
<https://wiki.mikrotik.com/wiki/Manual:API>
- Mikrotik Python  
[https://wiki.mikrotik.com/wiki/Manual:API\\_Python3](https://wiki.mikrotik.com/wiki/Manual:API_Python3)
- My Github  
<https://github.com/arrosid>



# Got more question? Stay in touch!



Ahmad Rosid Komarudin



[fb.com/ahmadrosidkomarudin](https://fb.com/ahmadrosidkomarudin)



[github.com/arrosid](https://github.com/arrosid)



[@ahmadrosidkomarudin](https://@ahmadrosidkomarudin)



[linkedin.com/in/arrosid](https://linkedin.com/in/arrosid)