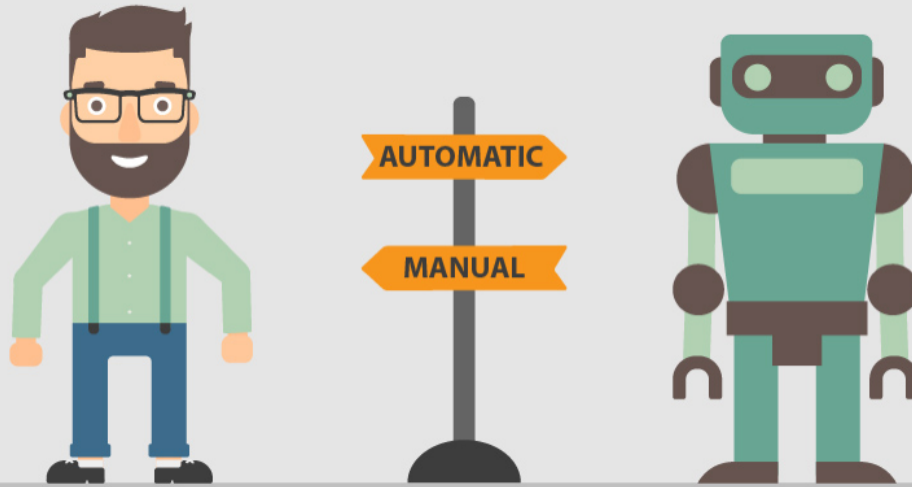




Zero Touch Provisioning using Python & Mikrotik API

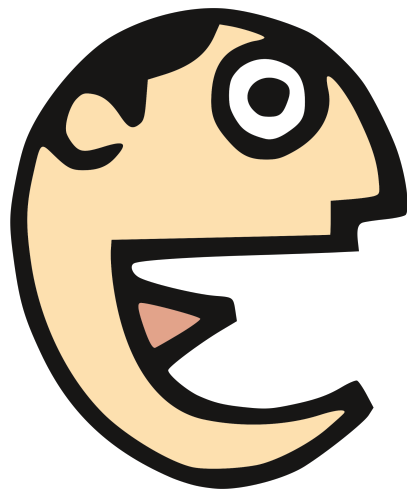
Ahmad Rosid Komarudin, TR0574

Network Engineer & SDN Developer, PT Network Data Sistem

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 where 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, ntp client, 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

Why I can't ssh to my router??

See!! ssh service is blocked by your firewall!





General Problem

- **Miscommunication** is daily habit

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

Who create new user in my router?!!!

Who else if not him?!!



General Problem

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



When this jobs done!!!

General Problem

- Non standard configuration

The public interface
is ether1!!



Yesterday you say
ether5!!!





Solution!!!



Solution

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

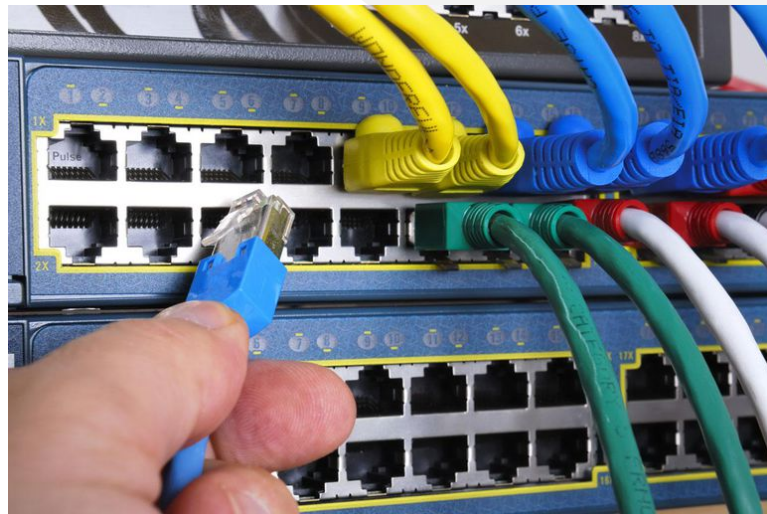


Hello, I'm
Baymax



Solution

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





Mikrotik Scripting

- Used to automate simple stuff in single router

```
MMM      MMM      KKK
MMM      MMM      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)

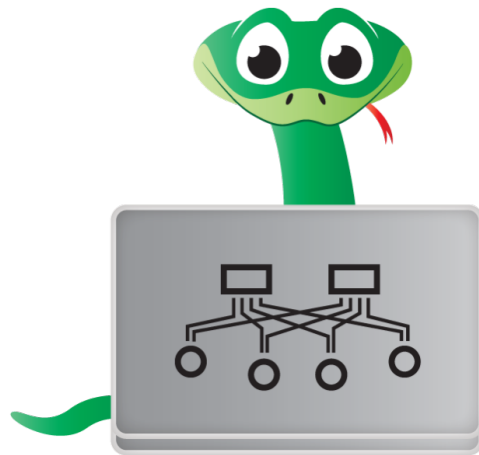
- Configure simple queue for target-address 192.168.1.100-192.168.1.200

```
: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



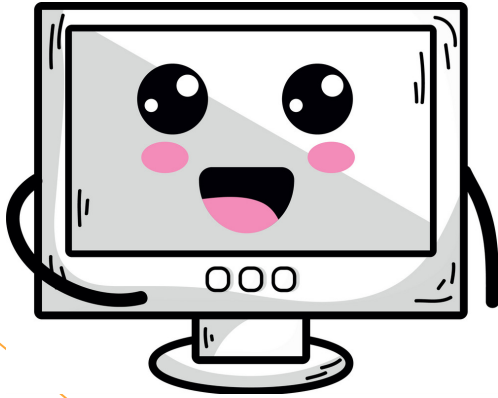
```
[admin@Mikrotik] > ip firewall nat print
Flags: X - disabled, I - invalid,
```

```
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

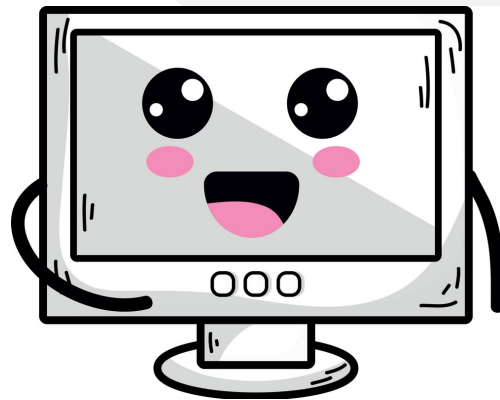
ip_address = ["192.168.99.1", "192.168.99.2", "192.168.99.3"]

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



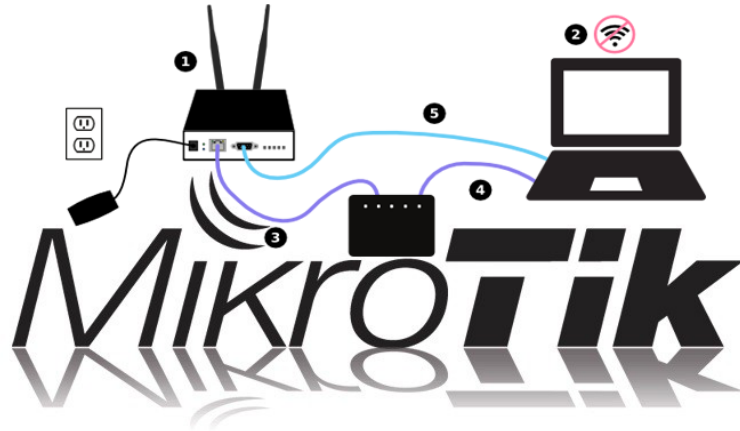
Use case

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



Use case

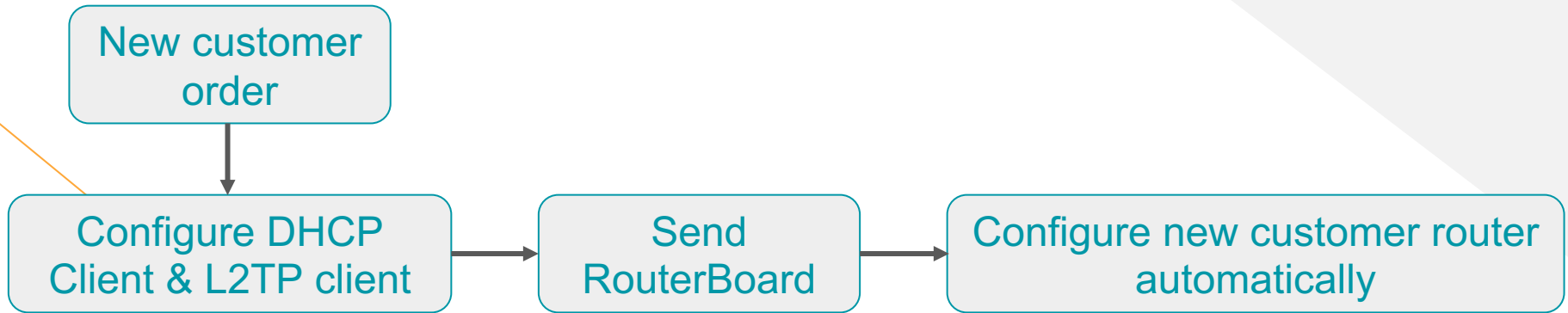
- Setup new customer in ISP
 - Same private IP
 - Same firewall rule
 - Same NAT rule
 - Same security rule





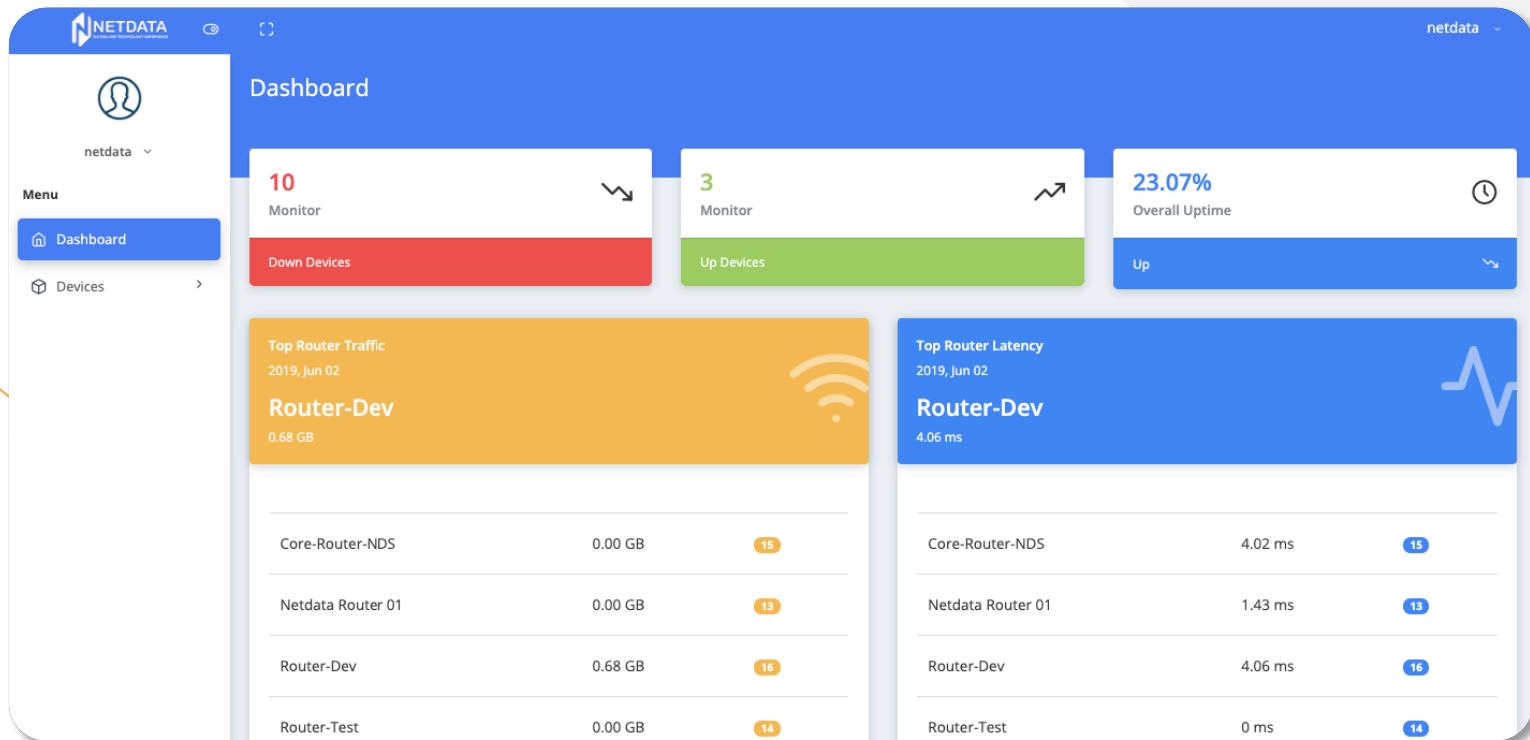
Demo Time

Flow Chart





Netdata SD-WAN Demo





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!



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