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MikroTik Security : The Forgotten Things

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Hello, I am **Michael Takeuchi**

From Jakarta, Indonesia

What is Security? (in Computer)

- **Computer security**, **cybersecurity** or **information technology security** (**IT security**) is the protection of computer systems from theft or damage to their hardware, software or electronic data, as well as from disruption or misdirection of the services they provide.

  - Wikipedia, https://en.wikipedia.org/wiki/Computer_security

What is Security? (in Computer Network)

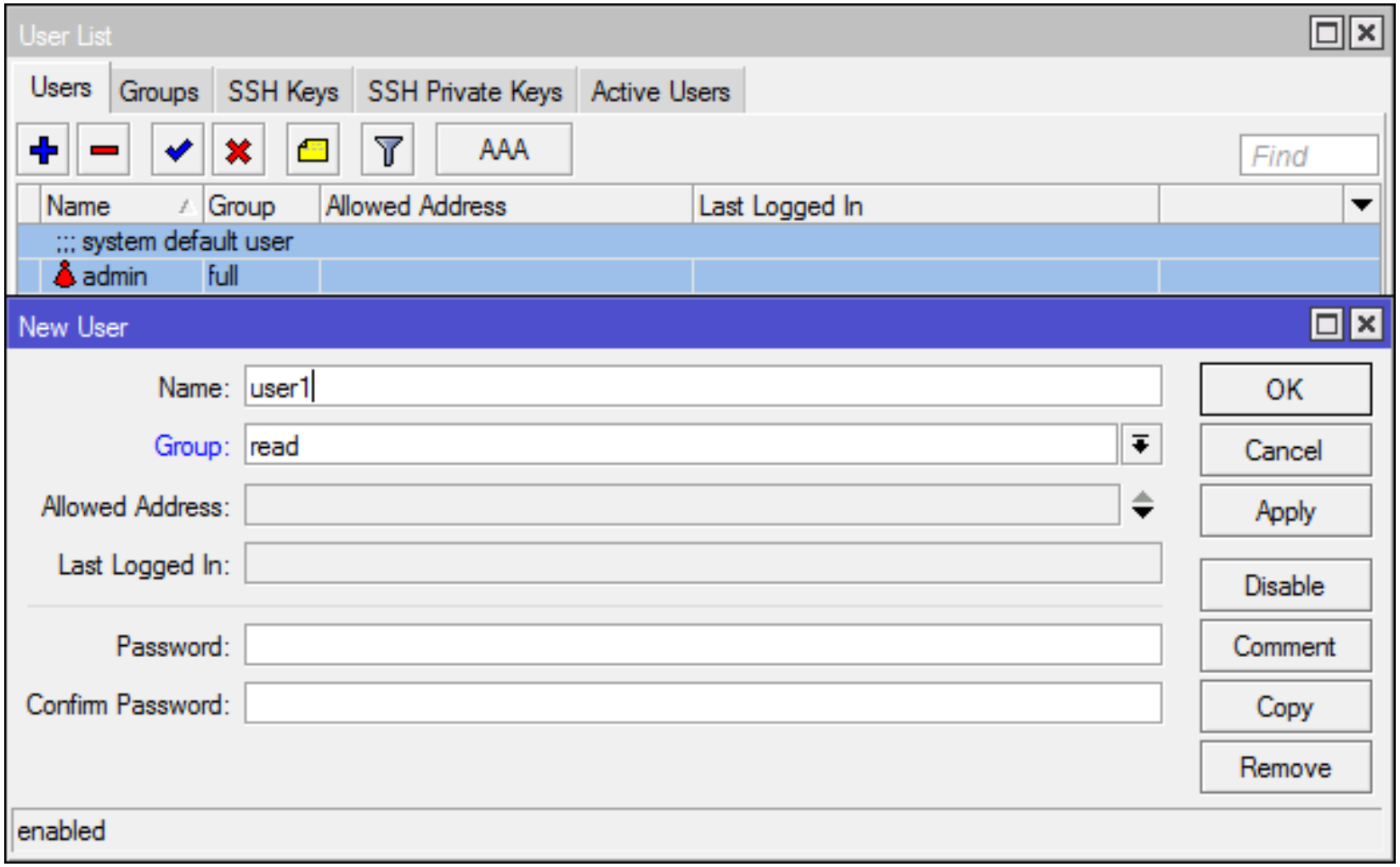
- **Network security** consists of the policies and practices adopted to prevent and monitor unauthorized access, misuse, modification, or denial of a computer network and network-accessible resources. Network security involves the authorization of access to data in a network, which is controlled by the network administrator

  - Wikipedia, https://en.wikipedia.org/wiki/Network_security

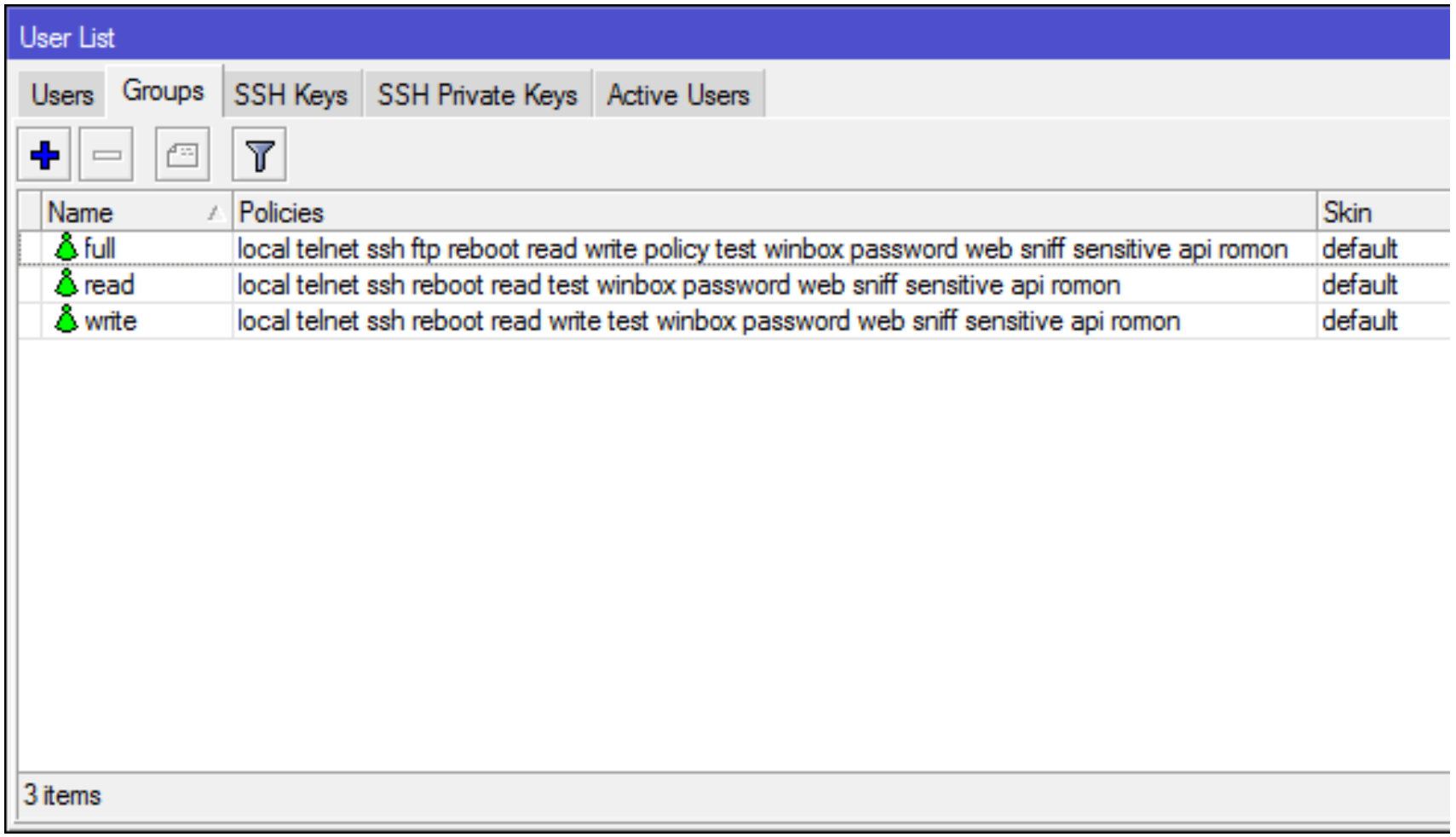
Continuing

- After we talk about what security is, now I will explain some forgotten things about your own router security that skipped by common junior network engineer
- We will focused on the router because that so **many vulnerabilities** appears because we forgot something with our router security

Router Login – Users



Router Login – Groups



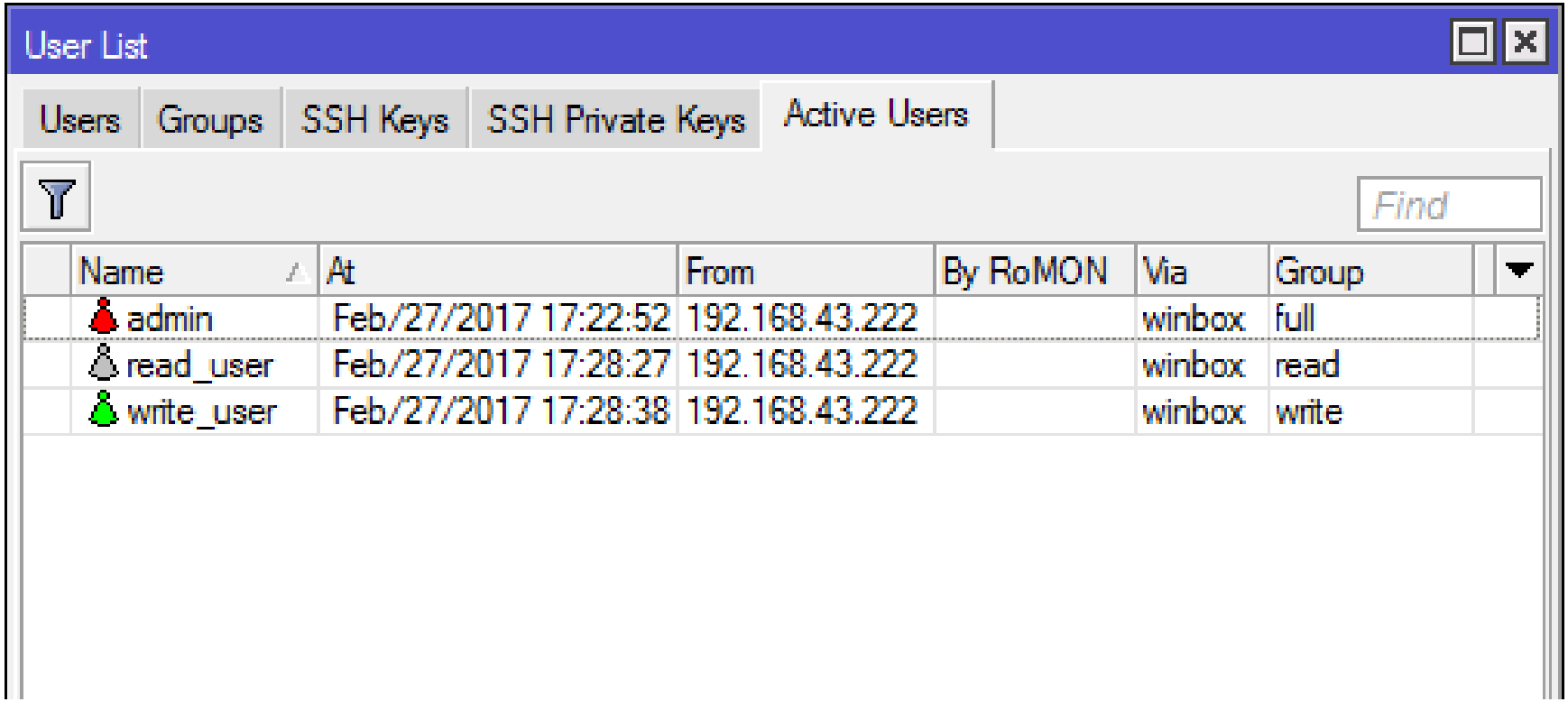
Router Login – Policies

- local - policy that grants rights to log in locally via console
- telnet - policy that grants rights to log in remotely via telnet
- ssh - policy that grants rights to log in remotely via secure shell protocol
- web - policy that grants rights to log in remotely via WebBox
- winbox - policy that grants rights to log in remotely via WinBox
- password - policy that grants rights to change the password
- api - grants rights to access router via API.
- dude - grants rights to log in to dude server.
- ftp - policy that grants full rights to log in remotely via FTP and to transfer files from and to the router.

Router Login – Policies

- reboot - policy that allows rebooting the router
- read - policy that grants read access to the router's configuration. All console commands that do not alter router's configuration are allowed. write - policy that grants write access to the router's configuration, except for user management.
- policy - grants user management rights. Should be used together with write policy.
- test - policy that grants rights to run ping, traceroute, bandwidth-test, wireless scan, sniffer, snooper and other test commands
- sensitive - to see sensitive information in the router
- sniff - to use packet sniffer tool.
- romon - accessing romon

Router Login – Active Users



Enough?

Are we enough to have strong username & password?

BIG NO

Forgotten #1

RouterOS Vulnerabilities in 2012 – 2015

CVE #	Description
CVE-2015-2350	Cross-site request forgery (CSRF) vulnerability in MikroTik RouterOS 5.0 and earlier allows remote attackers to hijack the authentication of administrators for requests that change the administrator password via a request in the status page to /cfg.
CVE-2012-6050	he winbox service in MikroTik RouterOS 5.15 and earlier allows remote attackers to cause a denial of service (CPU consumption), read the router version, and possibly have other impacts via a request to download the router's DLLs or plugins, as demonstrated by roteros.dll.

Credit: https://www.cvedetails.com

RouterOS Vulnerabilities in 2017

CVE #	Description
CVE-2017-8338	A vulnerability in MikroTik Version 6.38.5 could allow an unauthenticated remote attacker to exhaust all available CPU via a flood of UDP packets on port 500 (used for L2TP over IPsec), preventing the affected router from accepting new connections; all devices will be disconnected from the router and all logs removed automatically.
CVE-2017-7285	A vulnerability in the network stack of MikroTik Version 6.38.5 released 2017-03-09 could allow an unauthenticated remote attacker to exhaust all available CPU via a flood of TCP RST packets, preventing the affected router from accepting new TCP connections.
CVE-2017-6297	The L2TP Client in MikroTik RouterOS versions 6.83.3 and 6.37.4 does not enable IPsec encryption after a reboot, which allows man-in-the-middle attackers to view transmitted data unencrypted and gain access to networks on the L2TP server by monitoring the packets for the transmitted data and obtaining the L2TP secret.

Credit: https://www.cvedetails.com

RouterOS Vulnerabilities in 2018

CVE #	Description
CVE-2018-1156	MikroTik RouterOS before 6.42.7 and 6.40.9 is vulnerable to stack buffer overflow through the license upgrade interface. This vulnerability could theoretically allow a remote authenticated attacker execute arbitrary code on the system.
CVE-2018-1157	MikroTik RouterOS before 6.42.7 and 6.40.9 is vulnerable to a memory exhaustion vulnerability. An authenticated remote attacker can crash the HTTP server and in some circumstances reboot the system via a crafted HTTP POST request.
CVE-2018-1158	MikroTik RouterOS before 6.42.7 and 6.40.9 is vulnerable to a stack exhaustion vulnerability. An authenticated remote attacker can crash the HTTP server via recursive parsing of JSON.
CVE-2018-1159	MikroTik RouterOS before 6.42.7 and 6.40.9 is vulnerable to a memory corruption vulnerability. An authenticated remote attacker can crash the HTTP server by rapidly authenticating and disconnecting.

Credit: https://www.cvedetails.com

RouterOS Vulnerabilities in 2018

CVE #	Description
CVE-2018-7445	A buffer overflow was found in the MikroTik RouterOS SMB service when processing NetBIOS session request messages. Remote attackers with access to the service can exploit this vulnerability and gain code execution on the system. The overflow occurs before authentication takes place, so it is possible for an unauthenticated remote attacker to exploit it. All architectures and all devices running RouterOS before versions 6.41.3/6.42rc27 are vulnerable.
CVE-2018-14847	MikroTik RouterOS through 6.42 allows unauthenticated remote attackers to read arbitrary files and remote authenticated attackers to write arbitrary files due to a directory traversal vulnerability in the WinBox interface.

Credit: https://www.cvedetails.com

those vulnerabilities were possible only on the routers which didn't have default firewall configuration,
or had improperly configured firewall

Forgotten #2

Good Things to Know

- MikroTik is growing rapidly and have bigger user year by year
- And because of that, many Hackers is interesting with MikroTik because so many infrastructure use MikroTik now
- And because of that, MikroTik vulnerabilities is also growing rapidly
- And because of that, DOESN'T MEAN MIKROTIK IS A BAD PRODUCT

"high winds blown on high hills"

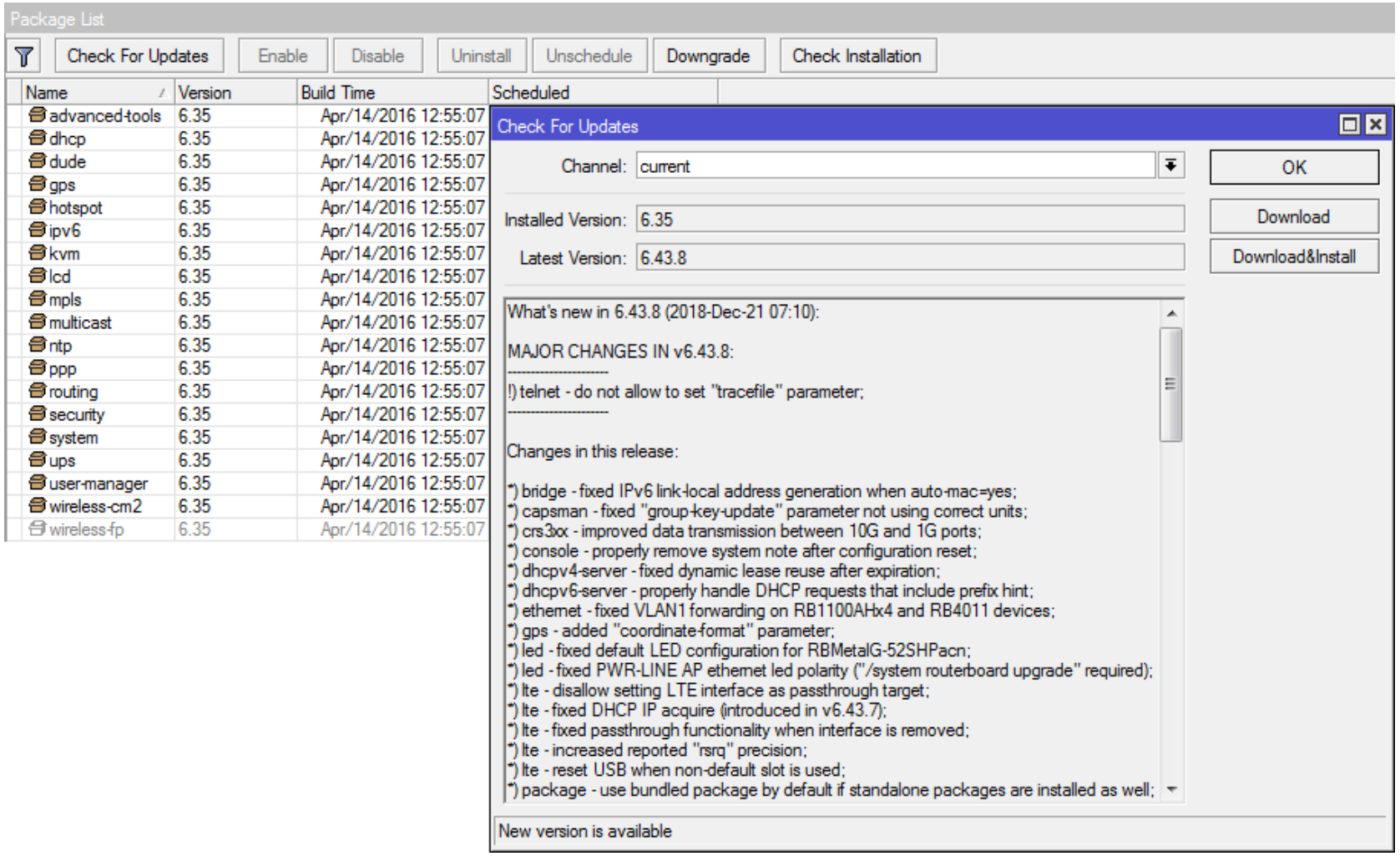
Forgotten #3

So What?

- Upgrade to Patched Version
- Protect all services
- Layered Security

Forgotten #4

Upgrade to Patched Version



Upgrade to Patched Version – Tips (RouterOS After 6.31)

```
[takeuchi@MikroTik] > {
{... /system package update
{... check-for-updates once
{... :delay 3s;
{... :if ( [get status] = "New version is available") do={ install }
{... }
           channel: current
  current-version: 6.35
            status: finding out latest version...
           channel: current
  current-version: 6.35
   latest-version: 6.43.8
            status: Downloaded 6% (1.5MiB)
-- [Q quit|D dump|C-z pause]
```

This script can applied for RouterOS After 6.31

Upgrade to Patched Version – Tips (RouterOS Until 6.31)

```
[takeuchi@MikroTik] > {
{... /system package update
{... check-for-updates
{... :delay 3s;
{... :if ( [get current-version] != [get latest-version]) do={ upgrade }
{... }


[takeuchi@MikroTik] /system package update>
```

This script can applied for RouterOS Until 6.31

Upgrade to Patched Version – Tips (Deploying)

You can deploy this script with:

- Ansible SSH (https://github.com/mict404/ansible-mikrotik-auto-upgrade)
- Python Paramiko
- MikroTik Scheduler
- Etc. (any other automation tools)
- ~~Manual~~ ☺

Protect All Services

To protect all services, you need to:

1. Enable the service you **only** need
2. Whitelisting
3. Securing

Protect All Services (Router Access & Discovery)

```
[takeuchi@MikroTik] > ip neighbor discovery-settings print
  discover-interface-list: none
[takeuchi@MikroTik] > ip service set [find name!=winbox] disabled=yes
[takeuchi@MikroTik] > ip service set winbox port=9999
[takeuchi@MikroTik] > ip service print
Flags: X - disabled, I - invalid
 #    NAME       PORT ADDRESS
 0  XI telnet       23
 1  XI ftp          21
 2  XI www          80
 3  XI ssh          22
 4  XI www-ssl     443
 5  XI api        8728
 6    winbox      9999
 7  XI api-ssl    8729
[takeuchi@MikroTik] > tool mac-server print
  allowed-interface-list: none
[takeuchi@MikroTik] > tool mac-server mac-winbox print
  allowed-interface-list: none
[takeuchi@MikroTik] > tool mac-server ping print
  enabled: no
[takeuchi@MikroTik] >
```

- Neighbor Discovery
- Services
- MAC-Server **(Extra Security for Layer 2 Networks)**

Protect All Services (Router Feature)

```
[takeuchi@MikroTik] > ip dns print
                    servers: 1.1.1.1
            dynamic-servers:
      allow-remote-requests: no
        max-udp-packet-size: 4096
       query-server-timeout: 2s
        query-total-timeout: 10s
     max-concurrent-queries: 100
max-concurrent-tcp-sessions: 20
                 cache-size: 2048KiB
               cache-max-ttl: 1w
                 cache-used: 17KiB
[takeuchi@MikroTik] > ip upnp print
                    enabled: no
allow-disable-external-interface: no
                 show-dummy-rule: yes
[takeuchi@MikroTik] > ip socks print
                  enabled: no
                     port: 1080
connection-idle-timeout: 2m
          max-connections: 200
[takeuchi@MikroTik] > tool bandwidth-server print
                  enabled: no
             authenticate: yes
allocate-udp-ports-from: 2000
             max-sessions: 100
[takeuchi@MikroTik] >
```

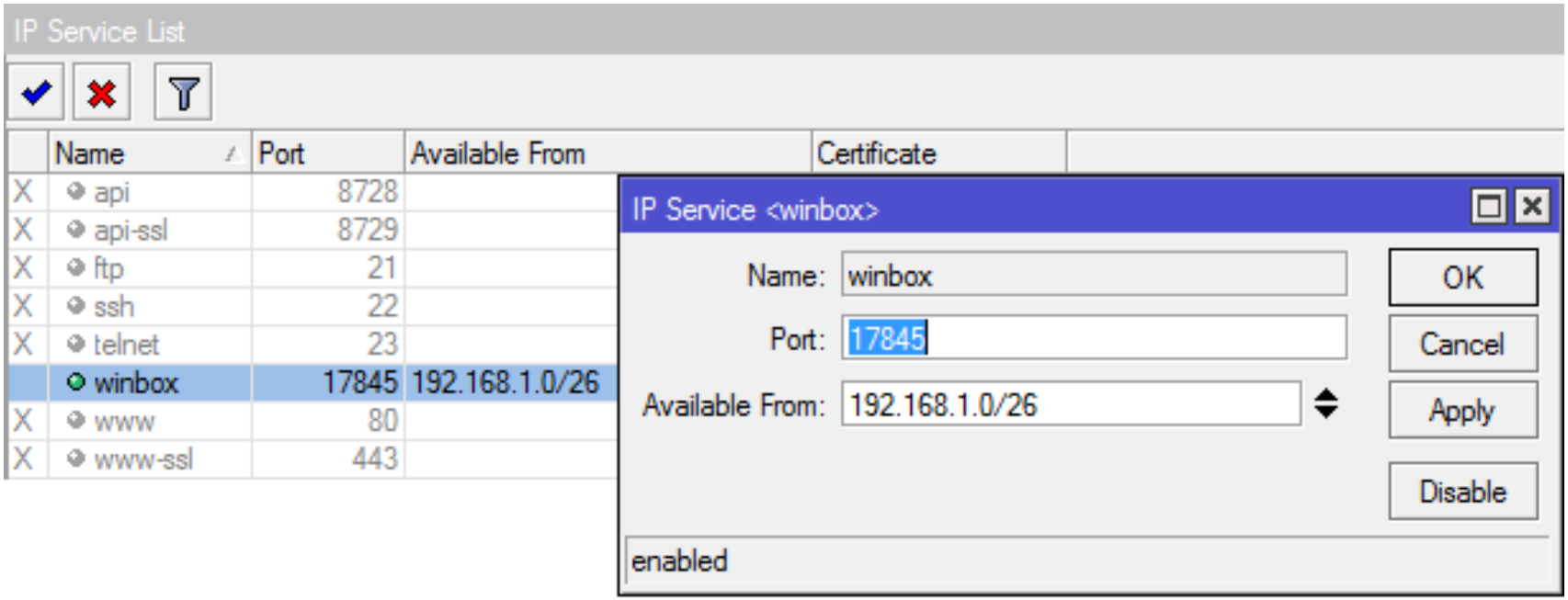
- DNS
- UPNP
- SOCKS
- Bandwidth Test Server

Protect All Services (Router Feature)

```
[takeuchi@MikroTik] > ip proxy print
                   enabled: no
               src-address: ::
                      port: 8080
                 anonymous: no
              parent-proxy: ::
         parent-proxy-port: 0
       cache-administrator: webmaster
           max-cache-size: unlimited
    max-cache-object-size: 2048KiB
            cache-on-disk: no
  max-client-connections: 600
  max-server-connections: 600
           max-fresh-time: 3d
    serialize-connections: no
        always-from-cache: no
           cache-hit-dscp: 4
               cache-path: web-proxy
[takeuchi@MikroTik] >
```

- Proxy

Protect All Services (Whitelisting)



Protect All Services (Securing)

- This is an example how we can protect DNS and Proxy services from WAN

```
/ip firewall raw
add action=drop chain=prerouting dst-address-type=local dst-port=53 in-interface=[WAN] protocol=udp
add action=drop chain=prerouting dst-address-type=local dst-port=53 in-interface=[WAN] protocol=tcp
add action=drop chain=prerouting dst-address-type=local dst-port=8080 in-interface=[WAN] protocol=tcp
```

Layered Security (Port Knocking)

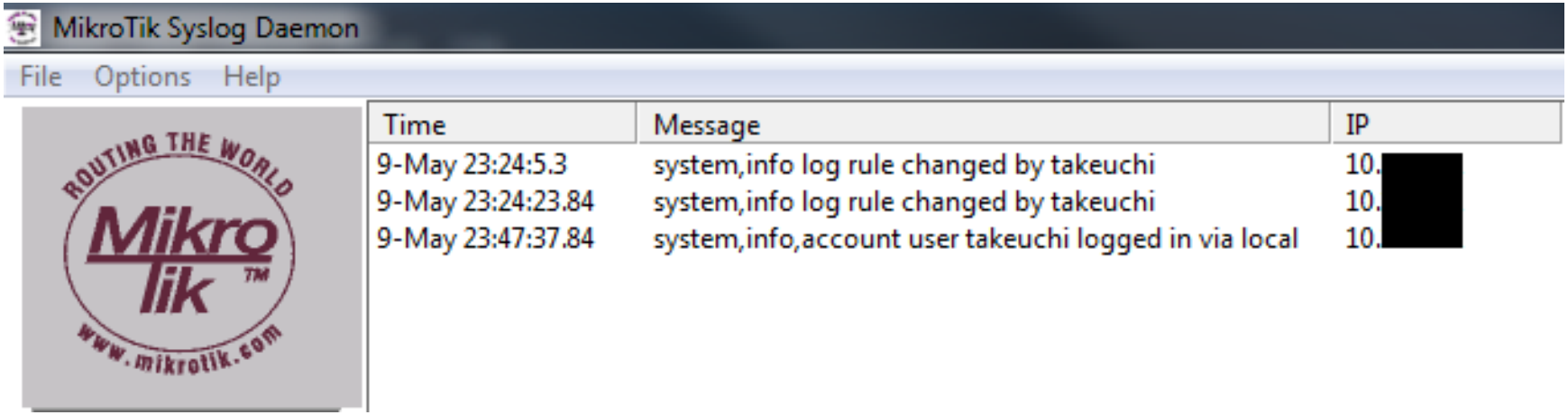
- This is an example how we can protect our Winbox Access with Port Knocking that need to knock to port **TCP/1234** first

```
/ip firewall raw
add action=add-src-to-address-list address-list=allow-winbox address-list-timeout=30m chain=prerouting comment="Port Knocking" dst-port=1234 protocol=tcp dst-address-type=local
add action=accept chain=prerouting comment="Allow Winbox" src-address-list=allow-winbox dst-port=[Winbox Port] protocol=tcp dst-address-type=local
add action=drop chain=prerouting dst-address-type=local dst-port=[Winbox Port] protocol=tcp
```

Layered Security (Logging)

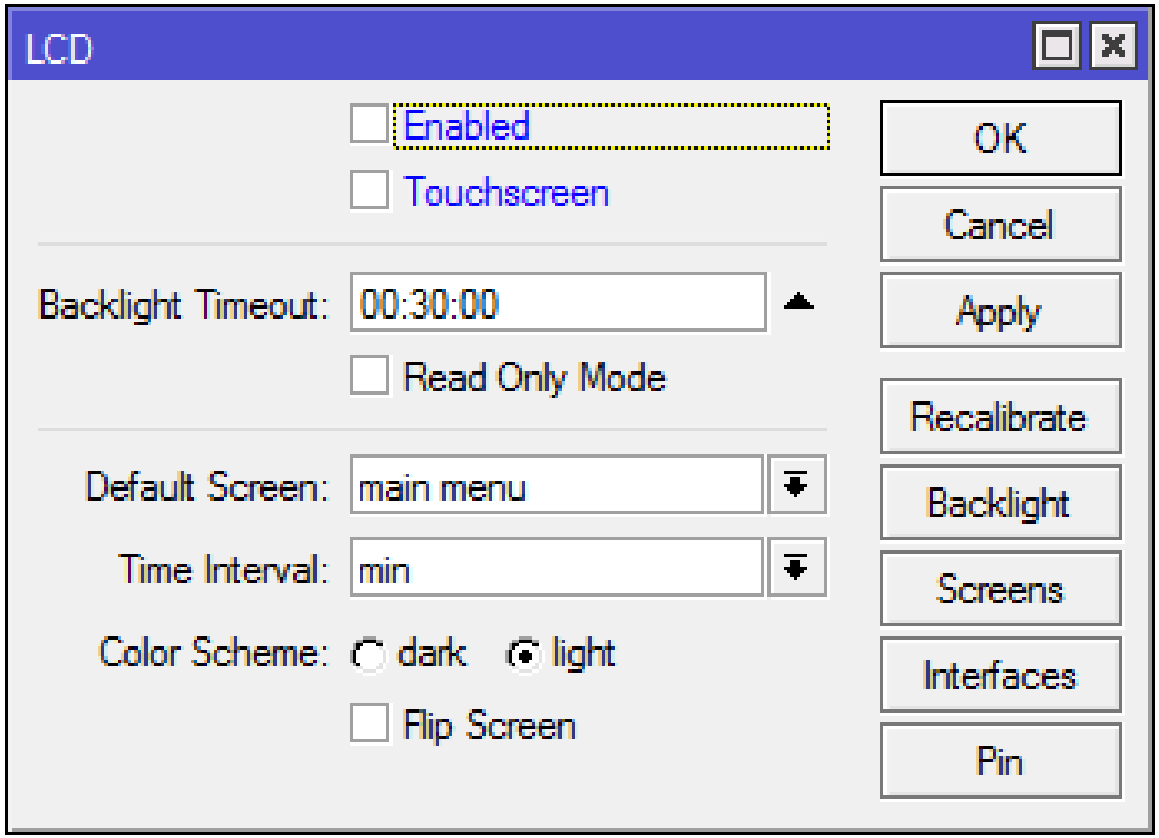
- Log with note everything router do, mostly hacker with clear log after they do something with our router, so I will recommend to use **syslog server** to save your log

```
/system logging action set [find name=remote]
remote=[syslog_server]
/system logging add topics=info action=remote
```



Layered Security (Physical – LCD)

- Don’t forget that somebody can do something to our router with LCD Screen only



Layered Security (Physical – Bootloader)

- Protected bootloader

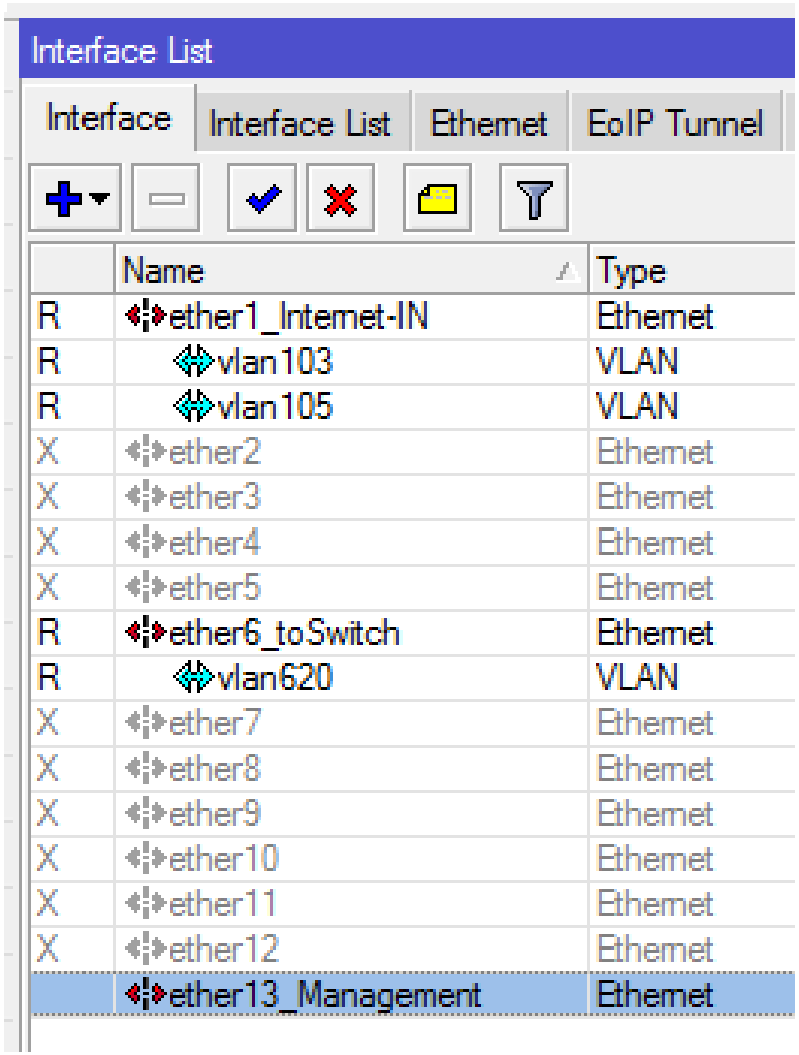
https://wiki.mikrotik.com/wiki/Manual:RouterBOARD_settings#Protected_bootloader

- **EXTREMELY DANGEROUS**, will disabled reset button & netinstall. If you forget the RouterOS password, the only option is to perform a complete **reformat** of both NAND and RAM with the following method, but you have to know the reset button hold time in seconds.

Layered Security (Physical – Power)

- Use 2 Different Source Power to Reach High Availability

Layered Security (Physical – Interfaces)



- Disable all unused interfaces to minimize unauthorized access to router

Layered Security (Backup)

- Backup is important when your router got hacked or you just forgot your password
- Make sure your backup file is save and can be accessible anytime
- **DON'T EVER TO SAVE YOUR BACKUP FILE IN ROUTER ONLY**

Forgotten #5

Layered Security (Backup Types)

1. Full Backup `(/system backup)`
   - Saved in Binary (Not Editable)
   - We Can Set a Password
   - Full Backup (Including User Login)
2. Partial Backup `(/export)`
   - Saved in Plain Text (Editable)
   - Partial Backup (e.g. “/ip firewall” only)
   - Not Including User Login

```
[takeuchi@MikroTik] > export file=Backup21Jan2019
[takeuchi@MikroTik] > system backup save name=Backup21Jan2019 dont-encrypt=yes
Saving system configuration
Configuration backup saved
[takeuchi@MikroTik] >
```

Secure ≠ Easy

Forgotten #6

Feel so hard to securing your infrastructure?

Let me help you!

michael@takeuchi.id

https://www.facebook.com/mict404

https://www.linkedin.com/in/michael-takeuchi/

Question & Answer

Slide is available in my GitHub repository
https://github.com/mict404/slide/