



KVM Virtualization

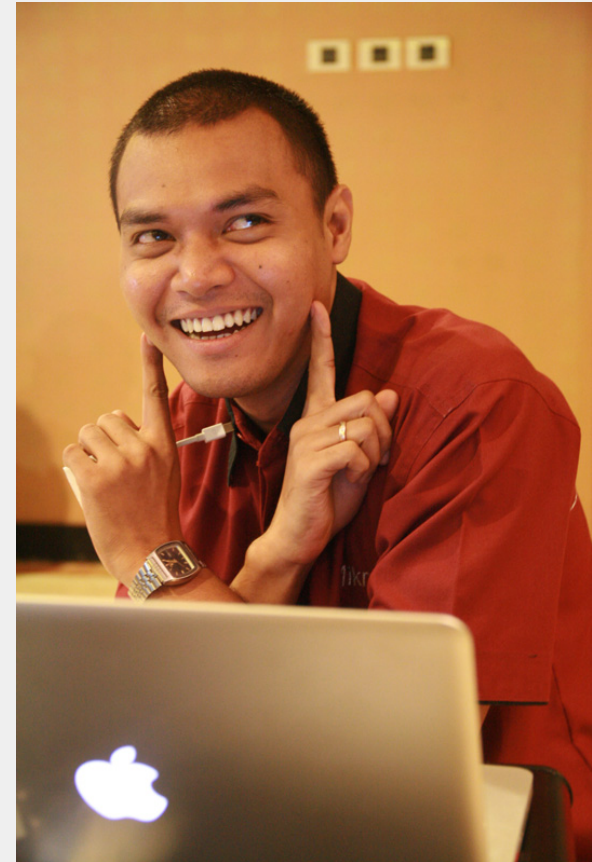
By: **Novan Chris**

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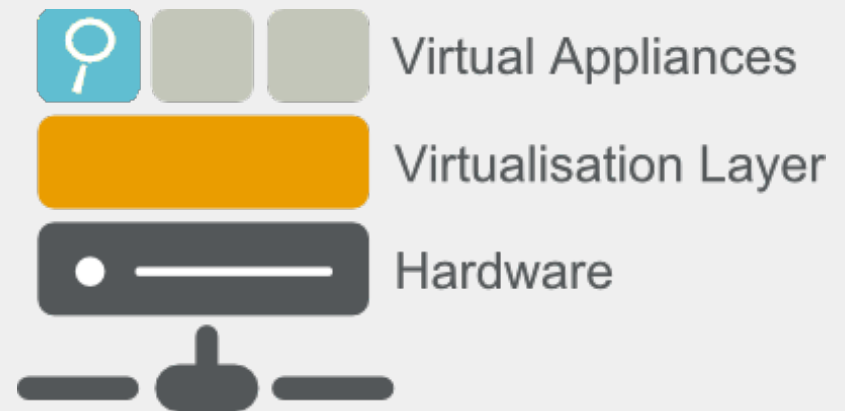
Introduction

- **Novan Chris**
- Work for Citraweb / Citranet
 - Mikrotik Distributor & Training Partner, ISP
- Product Manager & Support Manager
- Mikrotik Certified Trainer
- MTCNA, MTCTCE, MTCRE, MTCWE, MTCUME, MTCINE



Virtualization

- Virtualization jika dilihat dari sudut pandang “komputasi” adalah sebuah metode pembuatan Komputer Virtual.
- Virtualisasi apa saja yang bisa dibuat :
 - Virtual Hardware Platform
 - Virtual Operating System
 - Virtual Harddisk/Storage
 - Virtual Network Interface
 - Dll



Why Virtualization

- Pada Tahun 60an, awalnya Virtualization digunakan untuk memisahkan fungsi Komputer Mainframe supaya bisa melakukan tugas/fungsi yang berbeda.
- Spesifikasi Hardware cukup besar tetapi load processing yang masih kecil menyebabkan terjadinya idle resource.
- Idle Resource bisa dimanfaatkan untuk tugas yang lain (Supaya Efisien).

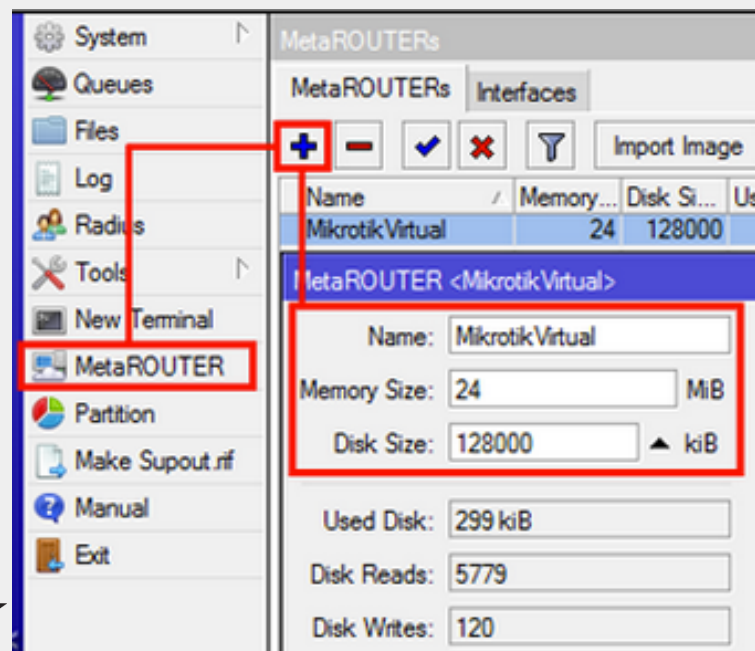


Virtualization Technology

- Teknologi Virtualisasi cukup berkembang saat ini, banyak Developer memberikan support Virtualisasi ke berbagai platform hardware.
 - Windows - Virtual PC
 - VM Ware
 - Hypervisor - Xen/KVM
 - Oracle - Virtual Box
- Teknologi Processor yang berkembang sangat pesat memungkinkan untuk melakukan Virtualisasi di platform Server, PC bahkan Network Processor.

MikroTik Virtualization

Mikrotik sudah mengimplementasikan Fitur Virtualisasi sejak versi 3.xx dan juga 4.xx, yaitu ketika RouterOS memiliki fitur MetaRouter di RouterBoard (MIPS & PPC).



The screenshot displays the MikroTik WinBox interface for configuring MetaRouters. The left sidebar shows the 'MetaROUTER' menu item highlighted. The main window shows a table of MetaRouters with the following data:

Name	Memory...	Disk Si...	Us
MikrotikVirtual	24	128000	

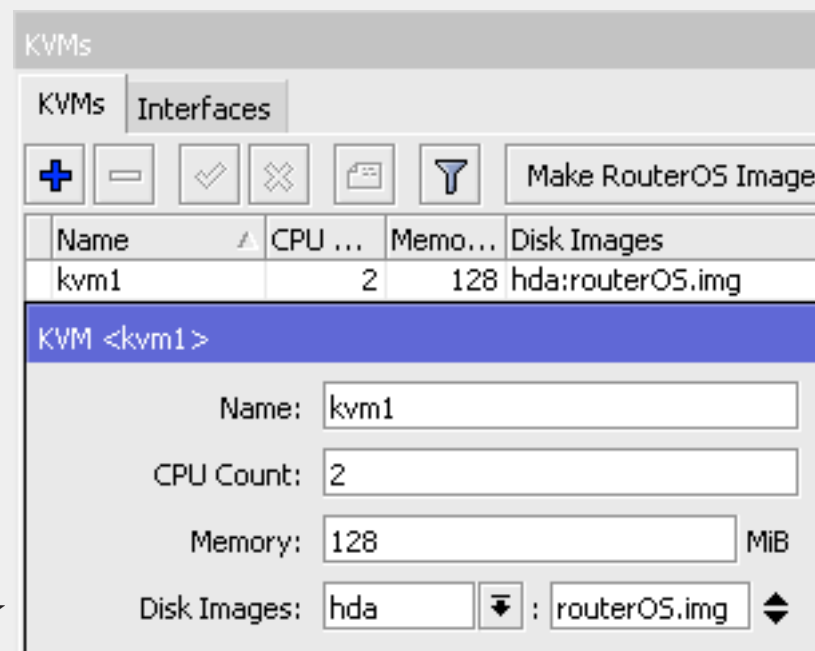
Below the table, the configuration details for the selected 'MikrotikVirtual' MetaRouter are shown:

- Name: MikrotikVirtual
- Memory Size: 24 MiB
- Disk Size: 128000 kiB
- Used Disk: 299 kiB
- Disk Reads: 5779
- Disk Writes: 120

MikroTik Virtualization

Mikrotik juga memiliki fitur virtualisasi untuk pengguna platform x86 (PC router) yaitu XEN.

- Sejak Versi 4.4, Mikrotik tidak menggunakan XEN lagi dan menggantinya dengan **KVM**.



The screenshot shows the WinBox interface for configuring a KVM. At the top, there are tabs for 'KVMs' and 'Interfaces'. Below the tabs is a toolbar with icons for adding (+), removing (-), checking (✓), deleting (✗), and filtering (funnel), along with a 'Make RouterOS Image' button. A table lists the KVMs:

Name	CPU ...	Memo...	Disk Images
kvm1	2	128	hda:routerOS.img

Below the table, the configuration for the selected KVM 'kvm1' is shown:

Name:

CPU Count:

Memory: MiB

Disk Images: :

KVM

- **Kernel Based Virtual Machine (KVM)** adalah salah satu teknologi Virtualisasi yang memanfaatkan kernel linux sebagai Mesin Virtual.
- Dengan adanya Mesin Virtual ini maka Berbagai Sistem Operasi bisa diinstall di dalamnya (Guest).
- KVM dapat dijalankan dengan baik pada Hardware yang sudah support dengan Virtualisasi Accelerator (Intel-VT, AMD-V, VIA-vt).

Virtual Resource

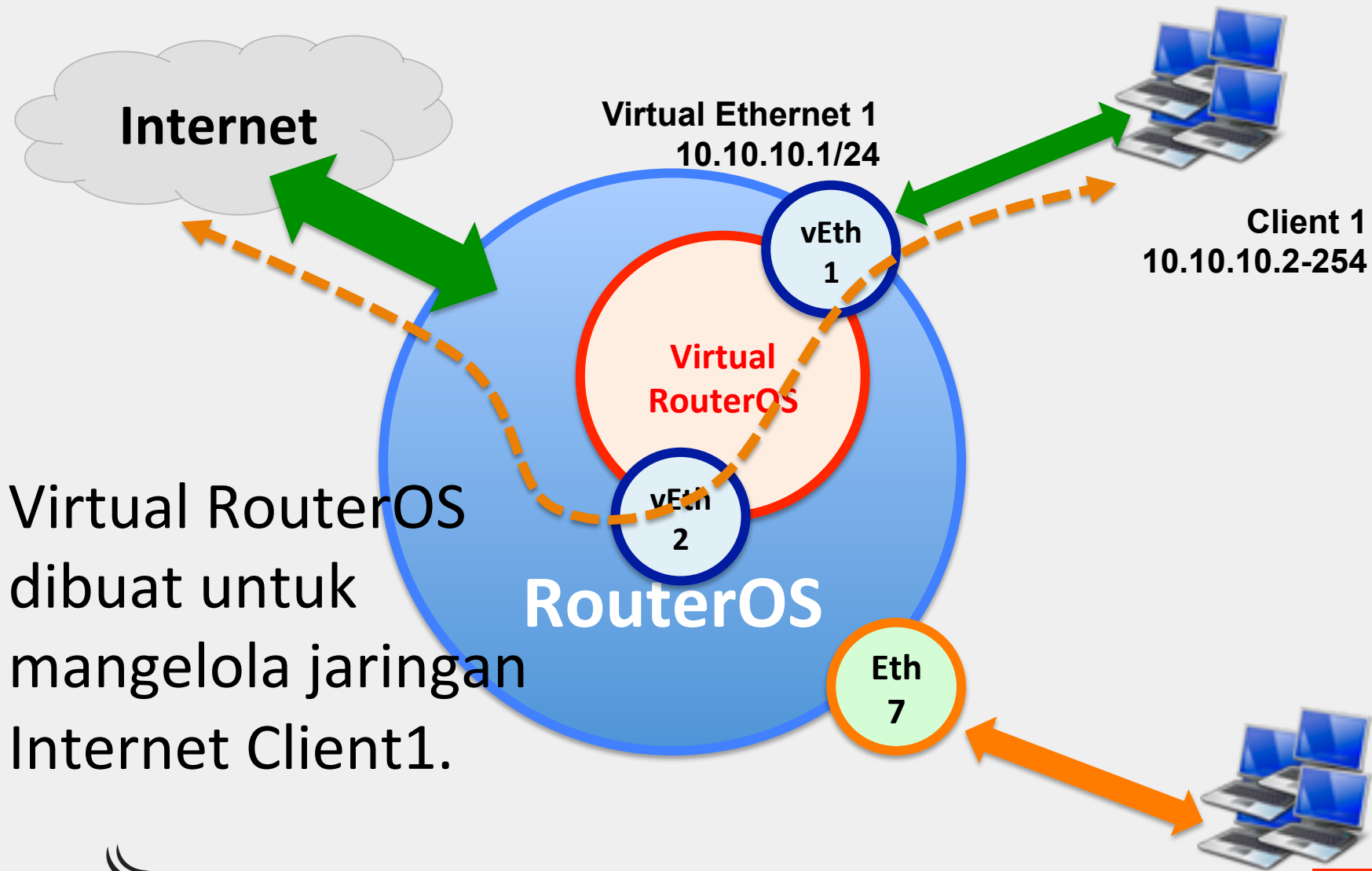
- Guest Machine, bisa memanfaatkan hardware yang ada (Processor, RAM, Network Interface, Hardisk dll).
- CPU
 - Intel VT-x
 - AMD-V
 - VIA-VT
- Graphic
 - Intel GVT
- Chipset
 - AMD-Vi, Intel VT-d & VT-c



Mikrotik – KVM

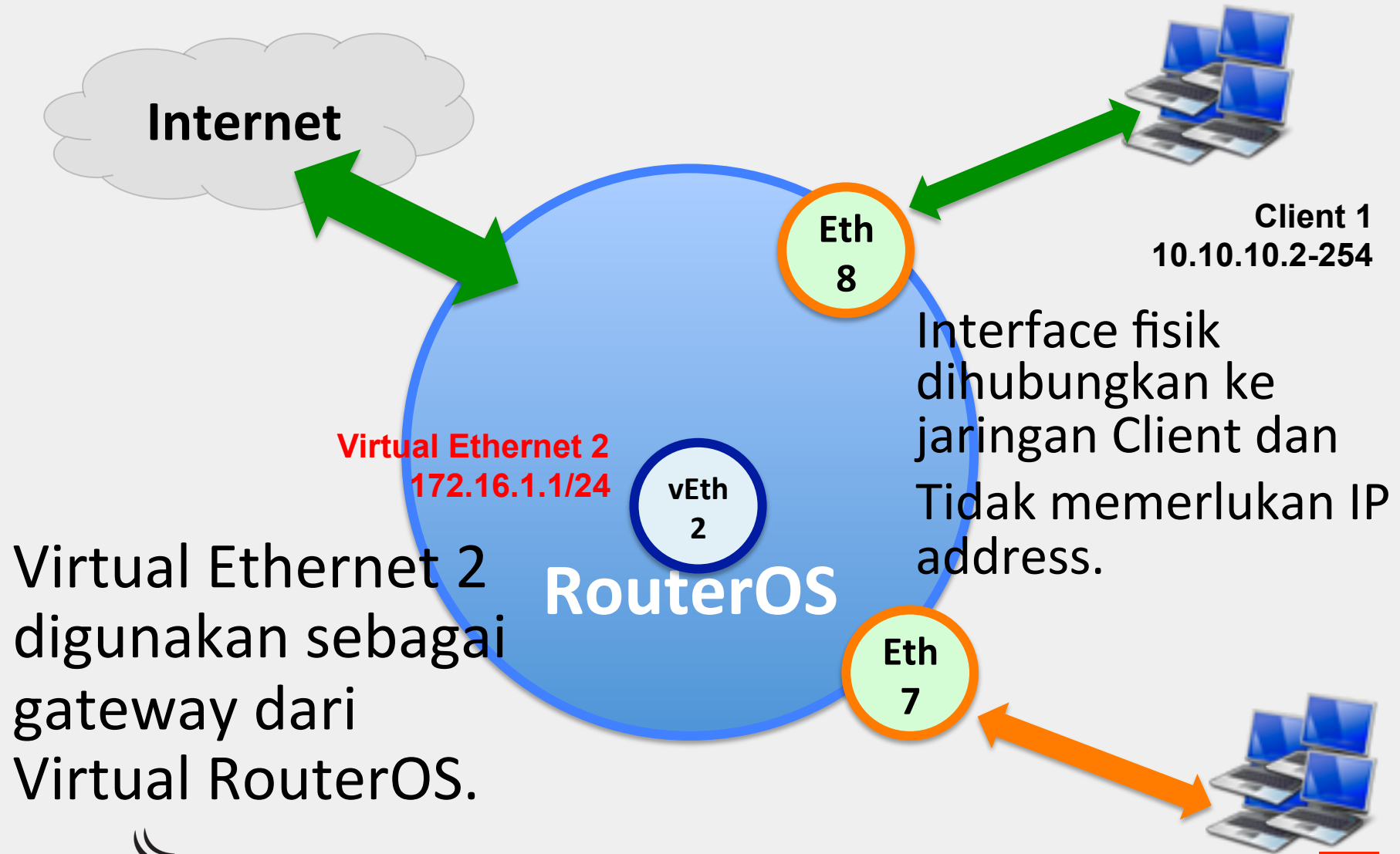
- Pada Mikrotik platform x86, kita bisa memanfaatkan Hardware Resource yang cukup besar untuk Virtualisasi.
- Kita bisa membangun beberapa **Virtual Router** untuk masing-masing Client, seakan Client memiliki Router yang independen.
- Untuk menghubungkan Virtual Router dengan Core network yang kita miliki, terdapat fitur Virtual Ethernet.

RouterOS + Virtual RouterOS



Virtual RouterOS
dibuat untuk
mangelola jaringan
Internet Client1.

RouterOS – Host OS

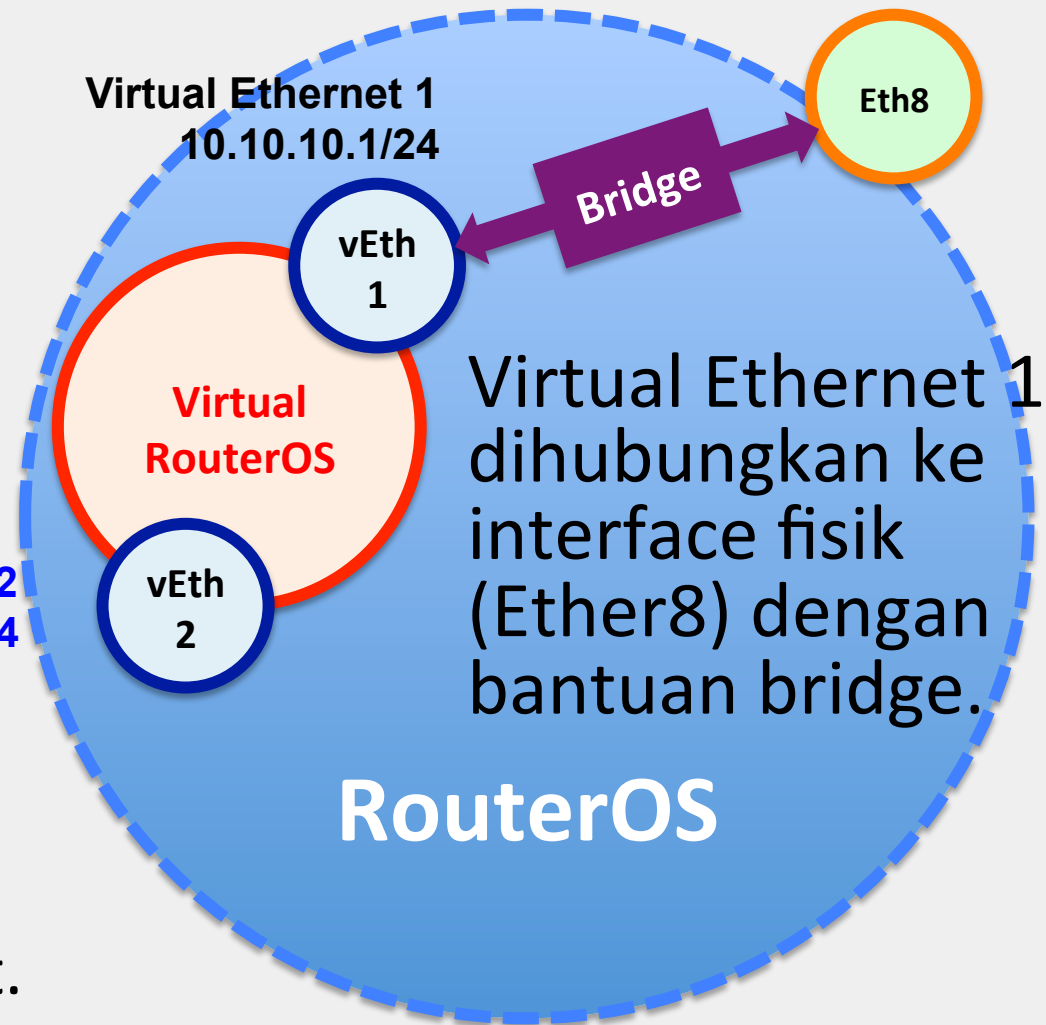


Virtual RouterOS (Guest OS)

Virtual ethernet 1 ditambahkan IP address yang nantinya akan menjadi Gateway Client.

Virtual Ethernet 2
172.16.1.254/24

Virtual ethernet 2 ditambahkan IP address supaya terkoneksi ke Internet.



Virtual RouterOS Image

The screenshot displays the MikroTik WinBox interface. The 'KVMs' tab is active, and the 'Make RouterOS Image' button is highlighted with a red box. A dialog box titled 'Make RouterOS Image' is open, showing the following fields:

- File Name: RouterOS-Client-1
- File Size: 64 MIB
- Configuration Script: (empty text area)
- Status: finished [\]

The 'File List' window is also visible, showing a table of files and directories. The file 'RouterOS-Client-1' is highlighted with a red box.

File Name	Type
MikroTik-20140919-0309.backup	backup
RouterOS-Client-1	file
pub	directory
sata1	disk
sata1/lost+found	directory

Virtual Ethernet 1 – to Client

The screenshot displays the MikroTik WinBox interface for configuring a new interface. The 'Interface List' tab is active, showing a list of interface types. The 'Virtual Ethernet' option is selected and highlighted with a red box. A red arrow points from this selection to the 'New Interface' dialog box. In the 'New Interface' dialog, the 'Name' field is set to 'vif1-client-1' and is also highlighted with a red box. Other fields in the dialog include 'Type' (virtual Ethernet), 'MTU' (1500), 'L2 MTU' (empty), 'MAC Address' (02:1B:44:BF:67:C7), and 'ARP' (enabled).

Interface List

Interface Ethernet EoIP Tunnel IP Tunnel

+ - ✓ ✗

New Interface

General Traffic

Name: vif1-client-1

Type: virtual Ethernet

MTU: 1500

L2 MTU:

MAC Address: 02:1B:44:BF:67:C7

ARP: enabled

Virtual Ethernet

Virtual Ethernet 2 – to Gateway

The screenshot displays the MikroTik WinBox interface for configuring a new interface. The 'Interface List' tab is active, showing a list of interface types. The 'Virtual Ethernet' option is highlighted with a red box. The 'New Interface' dialog box is open, showing the 'General' tab. The 'Name' field is set to 'vif2-Gateway', and the 'Type' is set to 'Virtual Ethernet'. Other fields include 'MTU: 1500', 'L2 MTU:', 'MAC Address: 02:1B:44:BF:67:C7', and 'ARP: enabled'. A red arrow points from the 'Virtual Ethernet' selection in the list to the 'Name' field in the dialog.

Interface List

Interface Ethernet EoIP Tunnel IP Tunnel

+ - ✓ ✗

New Interface

General Traffic

Name: vif2-Gateway

Type: Virtual Ethernet

MTU: 1500

L2 MTU:

MAC Address: 02:1B:44:BF:67:C7

ARP: enabled

Virtual Ethernet

Bridge (Virtual-Ethernet-1 to Eth 8)

- Buat Bridge.
- Masukkan Virtual Ethernet 1 dan Ether 8 ke dalam Bridge Port.

The image displays a network configuration interface with three panels. The top panel, titled 'Bridge', shows a list of bridges with a '+' button highlighted by a red box. Below this, the configuration for a bridge named 'bridge-virtual-to-client' is shown, with its name field also highlighted by a red box. The bottom-left panel, titled 'Bridge Port <ether8>', shows the configuration for a bridge port connected to the 'ether8' interface, with the 'Interface' and 'Bridge' fields highlighted by a red box. The bottom-right panel, titled 'Bridge Port <vif1-clie', shows the configuration for a bridge port connected to the 'vif1-client-1' interface, with the 'Interface' and 'Bridge' fields highlighted by a red box. Red arrows indicate the flow of configuration from the bridge creation step to the specific bridge port configurations.

Bridge

Bridge Ports Filters NAT Hosts

+ - ✓ ✗ 📁 🗑️ Settings

Interface <bridge-virtual-to-client>

General STP Status Traffic

Name: bridge-virtual-to-client

Type: Bridge

MTU: 1500

Bridge Port <ether8>

General Status

Interface: ether8

Bridge: bridge-virtual-to-client

Priority: 80

Path Cost: 10

Horizon:

Bridge Port <vif1-clie

General Status

Interface: vif1-client-1

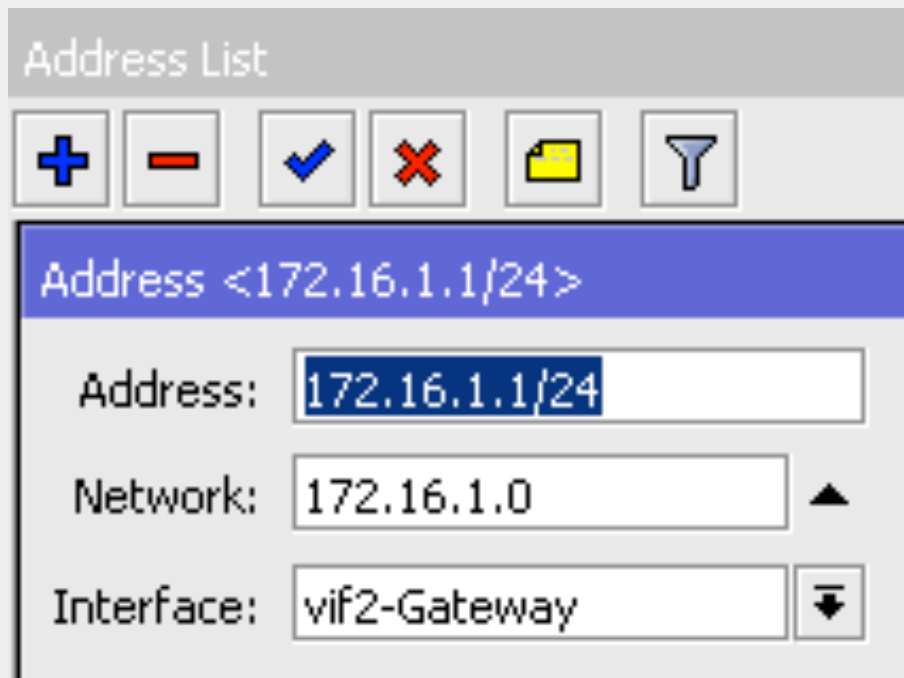
Bridge: bridge-virtual-to-client

Priority: 80 hex

Path Cost: 10

Horizon:

Virtual Ethernet 2 – Gateway



The screenshot shows the Mikrotik WinBox 'Address List' configuration window. The title bar reads 'Address List'. Below the title bar are six icons: a plus sign, a minus sign, a checkmark, a red X, a folder, and a funnel. The main area has a blue header bar with the text 'Address <172.16.1.1/24>'. Below this, there are three input fields: 'Address:' with the value '172.16.1.1/24', 'Network:' with the value '172.16.1.0' and an upward-pointing arrow, and 'Interface:' with the value 'vif2-Gateway' and a downward-pointing arrow.

IP Address “172.16.1.1” akan menjadi gateway dari Virtual RouterOS.

- Vif2 sebagai Virtual Ethernet 2 Secara Logic adalah interface yang independen dan dianggap oleh RouterOS adalah Ethernet yang aktif.
- Kita bisa menambahkan IP address di interface tersebut.

KVM – RouterOS Guest

KVMs

KVMs Interfaces

+ - ✓ ✗ [Icon] [Icon] Make RouterOS Image Reconf

New KVM

Name:

CPU Count:

Memory: MiB

Disk Images: :

Kita bisa tentukan jumlah **Core Processor** dan juga alokasi **RAM** yang akan digunakan oleh Virtual Router.

Gunakan RouterOS Image sebagai Hardisk Utama.

File <RouterOS-Client-1 >

File Name:

Type:

Size:

Creation Time:

KVM – Interface

KVMs

KVMs Interfaces

+ - ↕ ✕ 🔍

New VM Interface

Virtual Machine: kvm1

Type: dynamic static

Host MAC Address: 02:C7:A5:79:9B:22

VM MAC Address: 02:EB:7E:58:7D:3F

Static Interface: vif1-client-1

VM Interface <02:49:7F:24:9B:88>

Virtual Machine: kvm1

Type: dynamic static

Host MAC Address: 02:1B:44:BF:67:C7

VM MAC Address: 02:49:7F:24:9B:88

Static Interface: vif2-Gateway

KVM <kvm1>

Name:

CPU Count:

Memory: MiB

Disk Images: :

Kernel:

Kernel Cmdline:

Initrd:

VNC Server:

VNC Server Display:

Snapshot

OK

Cancel

Apply

Disable

Comment

Copy

Remove

Console

Start

Shut down

Reboot

Pause

Continue

Tombol START untuk menjalankan Virtualisasi

Tombol CONSOLE untuk masuk ke dalam Virtual RouterOS

Virtual Router – Console

```
KVM kvm1
```

```
MikroTik 6.13
```

```
MikroTik Login: admin
```

```
Password: █
```

Kita bisa menggunakan console ini untuk mengkonfigurasi Virtual Router.

```
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 6.13 (c) 1999-2014      http://www.mikrotik.com/
```

```
[?]          Gives the list of available commands
command [?]  Gives help on the command and list of arguments

[Tab]       Completes the command/word. If the input is ambiguous,
            a second [Tab] gives possible options

/           Move up to base level
..         Move up one level
/command    Use command at the base level
dec/04/2014 20:53:45 system,error,critical login failure for user admin via 1
```



```
[admin@MikroTik] > █
```

Virtual Router – Ethernet Interface

```
KVM kvm1
[admin@MikroTik] > /interface ethernet print detail
Flags: X - disabled, R - running, S - slave
 0 R name="ether1" default-name="ether1" mtu=1500 mac-address=02:E5:40:04:EF:FD
    orig-mac-address=02:E5:40:04:EF:FD arp=enabled disable-running-check=yes
    auto-negotiation=yes
    advertise=10M-half,10M-full,100M-half,100M-full,1000M-half,1000M-full
    full-duplex=yes cable-settings=default speed=100Mbps

 1 R name="ether2" default-name="ether2" mtu=1500 mac-address=02:49:7F:24:9B:88
    orig-mac-address=02:49:7F:24:9B:88 arp=enabled disable-running-check=yes
    auto-negotiation=yes
    advertise=10M-half,10M-full,100M-half,100M-full,1000M-half,1000M-full
    full-duplex=yes cable-settings=default speed=100Mbps
[admin@MikroTik] >
```

- Terdapat 2 Ethernet.
- Ether1 terkoneksi ke ether Fisik (Ether8) dan juga ke client
- Ether2 Terkoneksi ke Virtual Ether 2 - Gateway

Virtual Router – Configuration

```
KVM kvm1
[admin@MikroTik] > /ip add add address=172.16.1.254/24 interface=ether2
[admin@MikroTik] > /ip add add address=10.10.10.1/24 interface=ether1
[admin@MikroTik] > /ip route add gateway=172.16.1.1
[admin@MikroTik] > ping 8.8.8.8
HOST                                SIZE TTL TIME  STATUS
8.8.8.8                             56  55 29ms
8.8.8.8                             56  55 27ms
    sent=2 received=2 packet-loss=0% min-rtt=27ms avg-rtt=28ms max-rtt=29ms

[admin@MikroTik] > █
```

Konfigurasi Virtual Router menggunakan Console sama seperti melakukan konfigurasi RouterOS menggunakan **Terminal**.

Virtual Router – Resource

KVMs

KVMs Interfaces

+ - ✓ ✕ [icon] [icon] Make RouterOS Image Reconf

New KVM

Name:

CPU Count:

Memory: MiB

Disk Images: :

```
[admin@MikroTik] > /system resource print
    uptime: 26m27s
    version: 6.13
    build-time: May/15/2014 16:03:12
    free-memory: 106.4MiB
    total-memory: 122.6MiB
    cpu: QEMU
    cpu-count: 8
    cpu-frequency: 3492MHz
    cpu-load: 0%
    free-hdd-space: 36.9MiB
    total-hdd-space: 62.0MiB
    write-sect-since-reboot: 230
    write-sect-total: 230
    architecture-name: x86
    board-name: x86
    platform: MikroTik
[admin@MikroTik] >
```

Host RouterOS – CPU Load

Resources

Uptime: 03:49:19

Free Memory: 1554.8 MiB

Total Memory: 1891.6 MiB

CPU: Intel(R)

CPU Count: 8

CPU Frequency: 3491 MHz

CPU Load: 10 %

Free HDD Space: 862.9 MiB

Total HDD Size: 965.1 MiB

Sector Writes Since Reboot: 210 896

Total Sector Writes: 210 896

Architecture Name: x86

Board Name: x86

Version: 6.13

Build Time: May/15/2014 16:03...

Profile (Running)

CPU: all

Start

Stop

Close

New Window

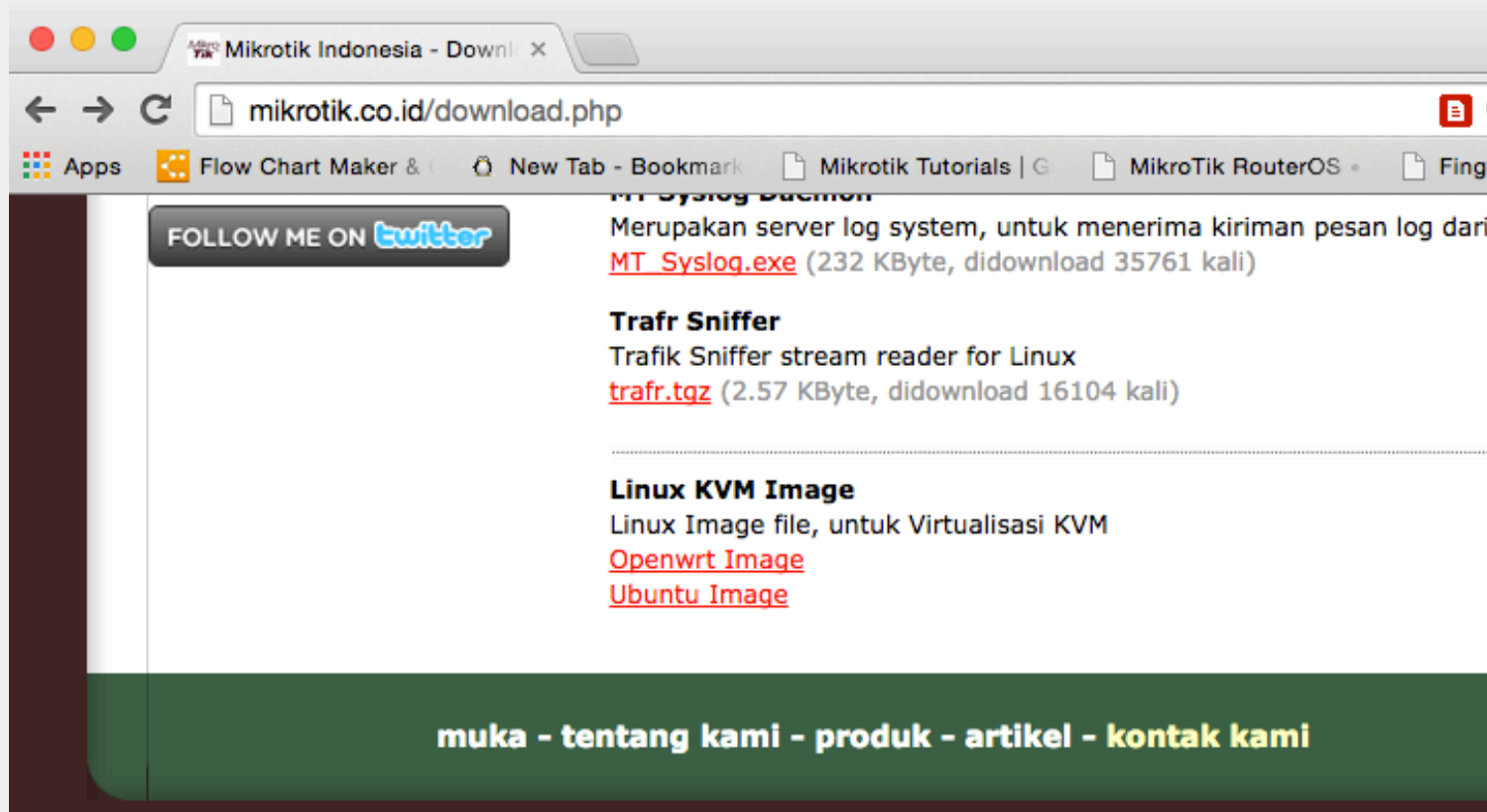
Name	CPU	Usage
firewall	6	0.0
firewall	7	0.5
idle	0	75.0
idle	1	87.0
idle	2	86.5
idle	3	75.0
idle	4	88.0
idle	5	87.0
idle	6	97.5
idle	7	90.5
kvm	0	1.0
kvm	1	9.0
kvm	2	5.5
kvm	3	10.5
kvm	4	11.5
kvm	5	4.5

62 items

Another Guest OS

- KVM di Mikrotik selain bisa digunakan untuk Virtual RouterOS, bisa juga digunakan untuk Virtualisasi OS yang lain.
- OS Linux bisa kita pasang sebagai Guest OS di KVM Mikrotik.
- Untuk bisa memasang Guest OS Linux, kita harus memiliki Linux Disk Image.

Download Disk Image



www.mikrotik.co.id/download.php

Linux KVM Guest - Openwrt

KVM <kvm2>

Name: kvm2

CPU Count: 8

Memory: 256 MiB

Disk Images: hda : sata1/openwrt/Openwrt-x86.img

KVM kvm2

```
BusyBox v1.22.1 (2014-08-12 05:46:51 WIB) built-in shell (ash)
Enter 'help' for a list of built-in commands.
```

```

|-----| .-----| .-----| .-----| .-----| | | | | | | | | | | | | | | | | |
| - | | | | | | | | | | | | | | | | | | | | | |
|-----| | | | | | | | | | | | | | | | | | | |
|_| W I R E L E S S F R E E D O M
```

```
-----
CHAOS CALMER (Bleeding Edge, r42143)
-----
```

```
* 1 1/2 oz Gin           Shake with a glassful
* 1/4 oz Triple Sec     of broken ice and pour
* 3/4 oz Lime Juice     unstrained into a goblet.
* 1 1/2 oz Orange Juice
* 1 tsp. Grenadine Syrup
-----
```

```
root@OpenWrt:/#
```

Linux KVM Guest - Ubuntu

KVM <kvm3>

Name:	<input type="text" value="kvm3"/>
CPU Count:	<input type="text" value="8"/>
Memory:	<input type="text" value="512"/> MiB
Disk Images:	<input type="text" value="hda"/> : <input type="text" value="sata1/ubuntu/Ubuntu_x86.img"/>

```
KVM kvm3
Ubuntu 10.04 LTS (none) ttyS0
(none) login: root
Password:
Last login: Thu Dec  4 15:01:41 GMT+7 2014 on ttyS0
Linux (none) 2.6.32-64-386 #128-Ubuntu SMP Tue Jul 15 09:05:45 UTC 2014 i686 GNU/L
inux
Ubuntu 10.04 LTS

Welcome to Ubuntu!
 * Documentation:  https://help.ubuntu.com/
root@(none):~#
```

Conclusion

- Virtualisasi bisa diimplementasikan di Mikrotik.
 - RouterBoard – MetaRouter
 - X86/PC Router – KVM
- Virtual Ethernet digunakan sebagai Network Interface di Virtual Router dan bisa dihubungkan ke Interface Fisik dengan Bridge.
- KVM tidak hanya bisa digunakan untuk Virtual Router, tetapi bisa juga digunakan untuk Virtual OS yang lain (Linux Server).



Thank You Mas Broo !!

www.mikrotik.co.id

info@mikrotik.co.id

[@mikrotik_id](#) – picture contest

Dijinkan menggunakan sebagian atau seluruh materi pada modul ini, baik berupa ide, foto, tulisan, konfigurasi, diagram, selama untuk kepentingan pengajaran, dan memberikan kredit dan link ke www.mikrotik.co.id