



# VRF – Routing like VPN

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[www.mikrotik.co.id](http://www.mikrotik.co.id)

The "mum" logo, consisting of the lowercase letters "mum" in a white, rounded, sans-serif font with a slight shadow effect, set against a yellow-to-orange gradient background.

mum

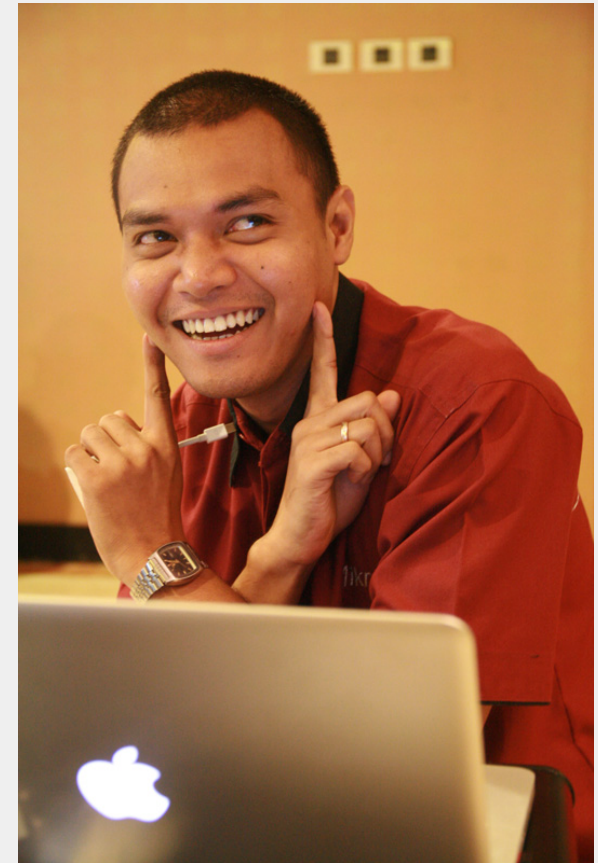
MikroTik User Meeting in Indonesia

November 29 - 30, 2013

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# Introduction

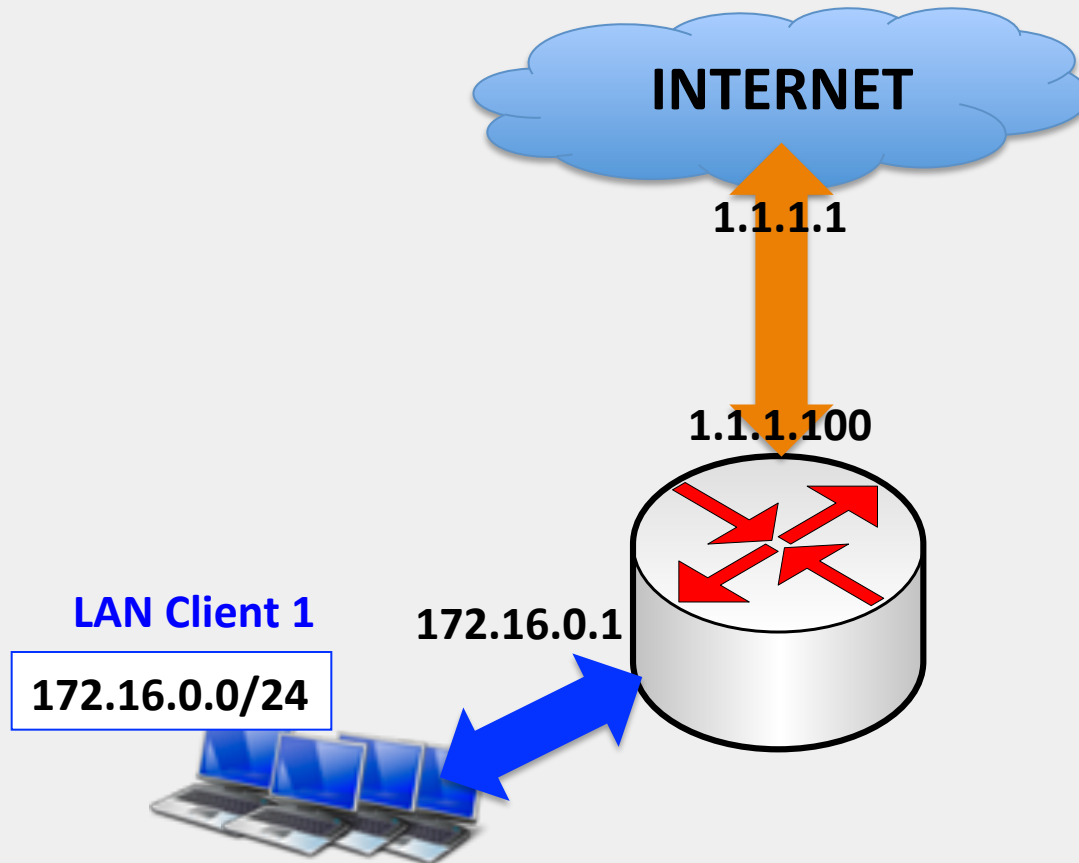
- **Novan Chris**
- Work for Citraweb / Citranet
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- Product Manager & Support Manager
- Mikrotik Certified Trainer
- MTCNA, MTCTCE, MTCRE, MTCWE, MTCUME, MTCINE



# Overview

- Basic Network Implementation (Case Study)
- Routing Problem
  - Solutions
- VRF
  - Policy Routing vs VRF
- Route Leaking & Route Consistency
- Conclusion + Q&A

# Basic Network Implementation

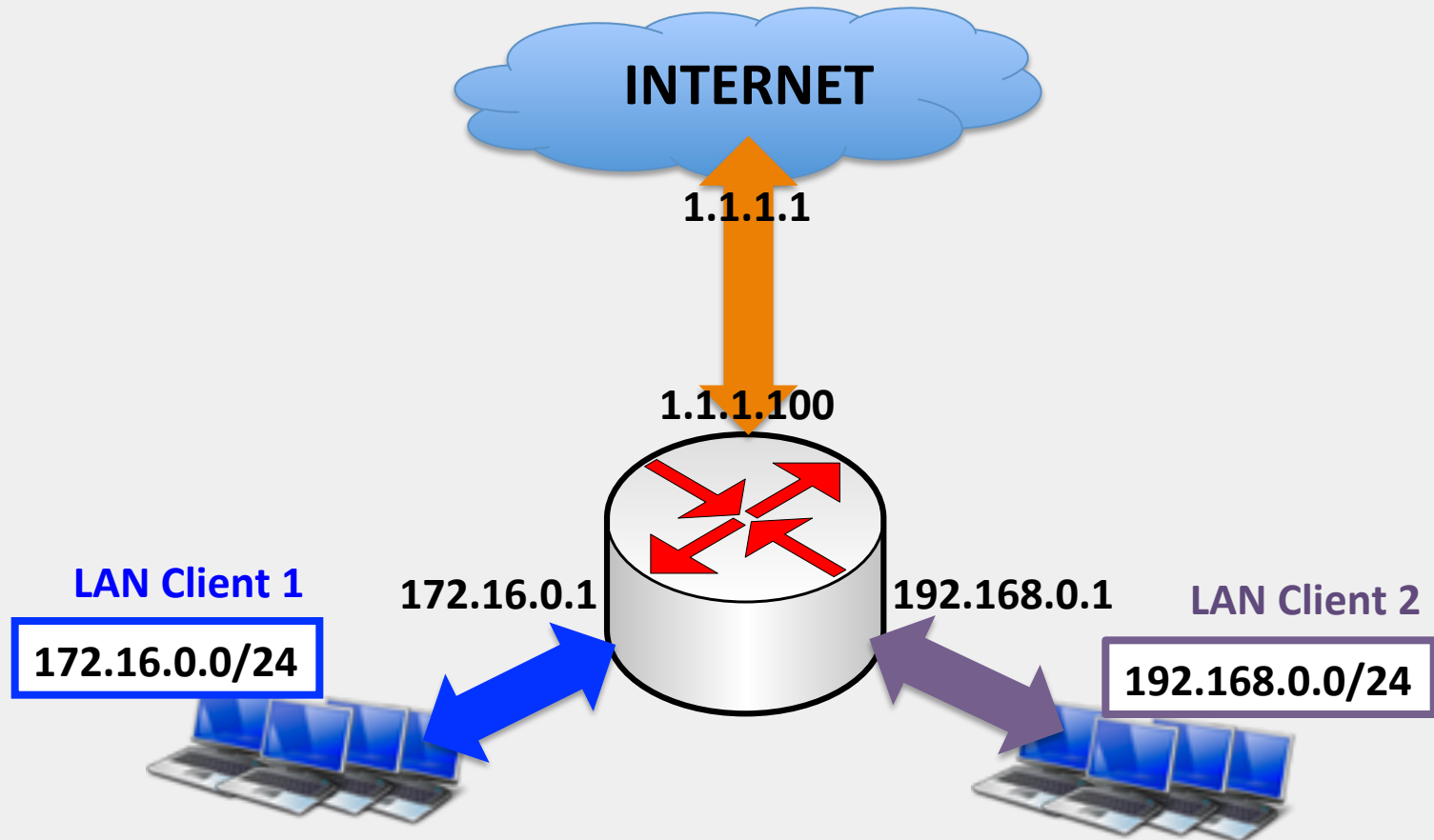


1 ip public, 1 Router, 1 Jaringan Local Client

# Basic Network Implementation

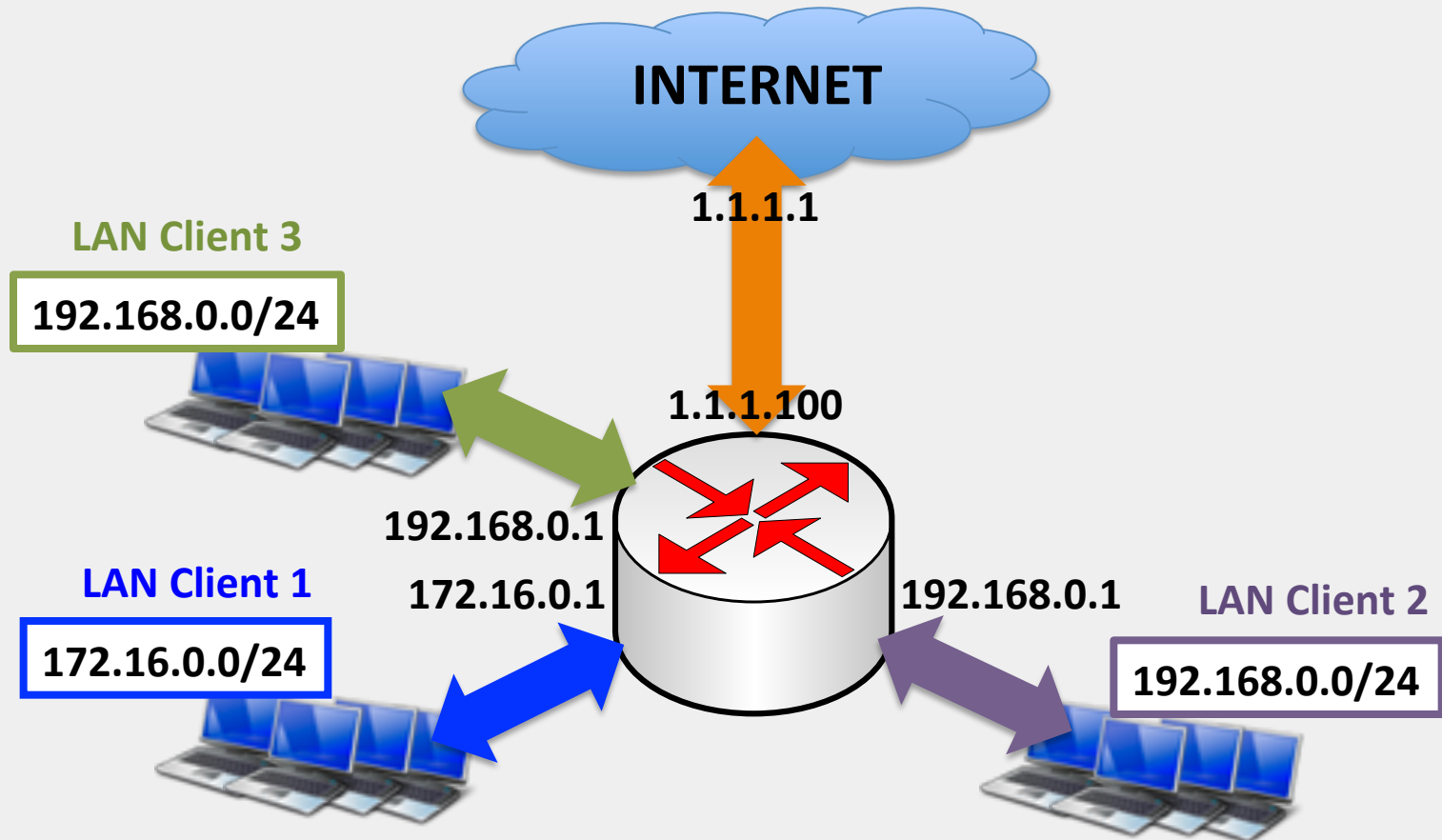
- 1 ip public didapatkan dari ISP
- Mengaktifkan NAT di Router Utama supaya jaringan client bisa ke internet
- Router Utama sebagai Default Gateway dari jaringan local client

# Basic Network Implementation



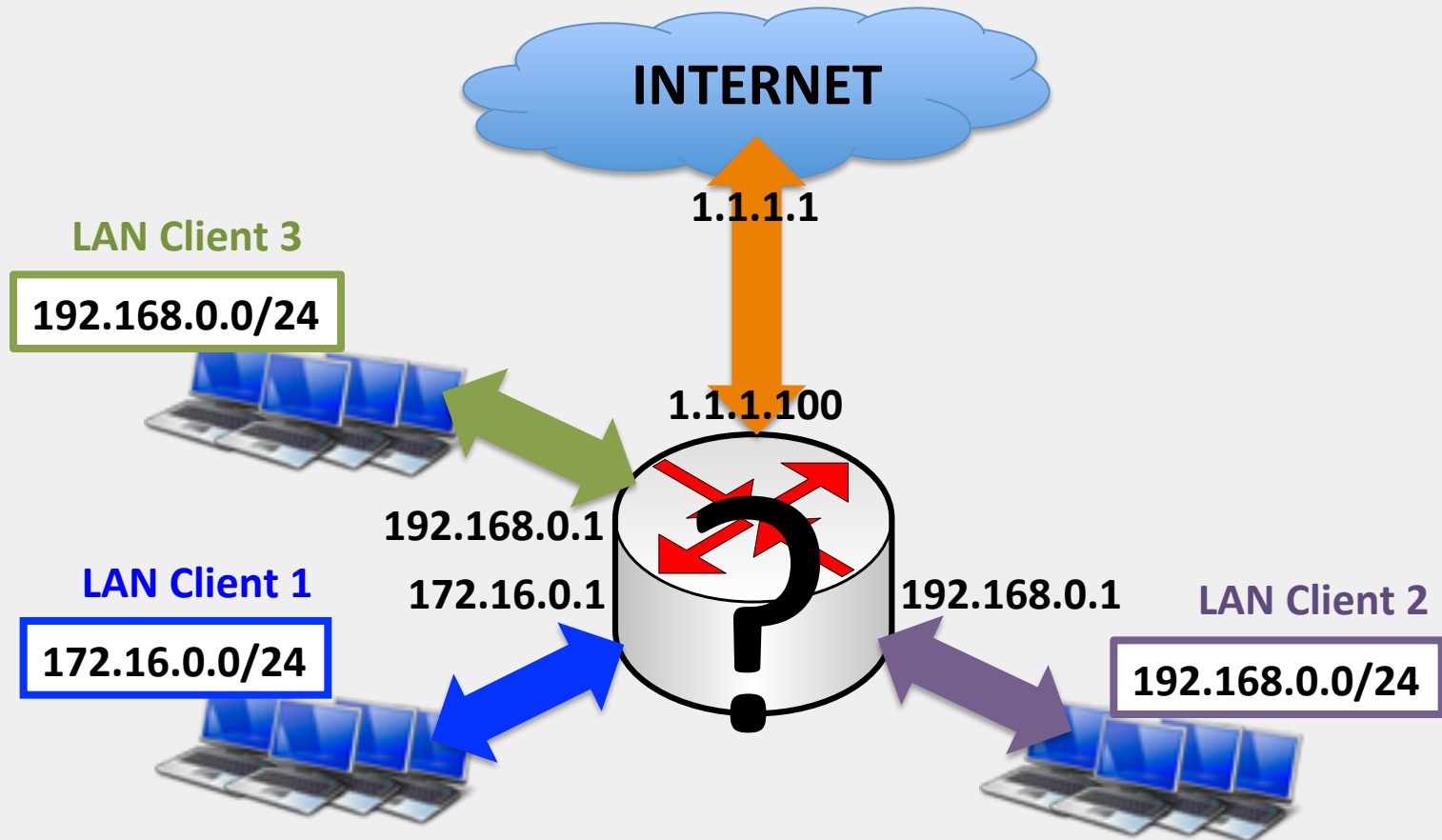
1 ip public, 1 Router, 2 Jaringan Local Client

# Basic Network Implementation



1 ip public, 1 Router, 3 Jaringan Local Client

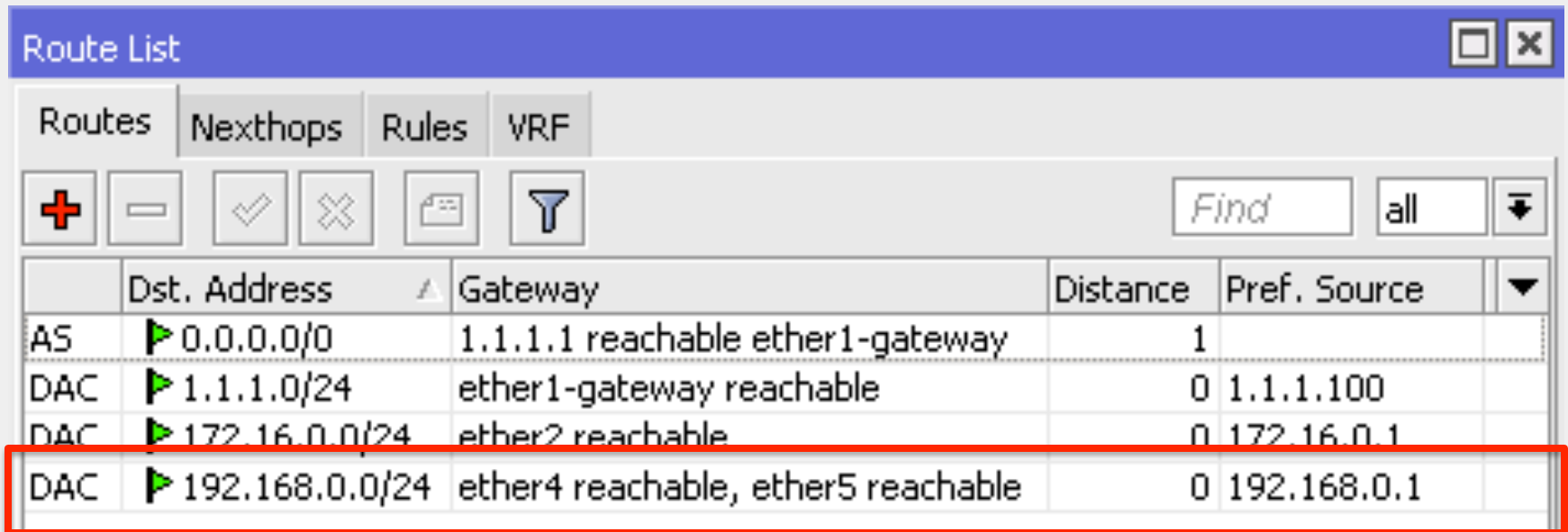
# Basic Network Implementation



1 ip public, 1 Router, 3 Jaringan Local Client ???



# Routing Table



Route List

Routes | Nexthops | Rules | VRF

+ - ✓ ✗ [icon] [icon] Find all [dropdown]

	Dst. Address	Gateway	Distance	Pref. Source	
AS	▶ 0.0.0.0/0	1.1.1.1 reachable ether1-gateway	1		
DAC	▶ 1.1.1.0/24	ether1-gateway reachable	0	1.1.1.100	
DAC	▶ 172.16.0.0/24	ether2 reachable	0	172.16.0.1	
DAC	▶ 192.168.0.0/24	ether4 reachable, ether5 reachable	0	192.168.0.1	

Router tidak bisa melakukan routing dengan sempurna, kenapa ?

# Routing Decision

- Untuk pemilihan rule routing, router akan memilih berdasarkan:
  - Rule routing yang paling spesifik tujuannya
    - Contoh: destination 192.168.0.128/26 lebih spesifik dari 192.168.0.0/24
  - Distance
    - Router akan memilih yang distance nya paling kecil
  - Round robin (random)

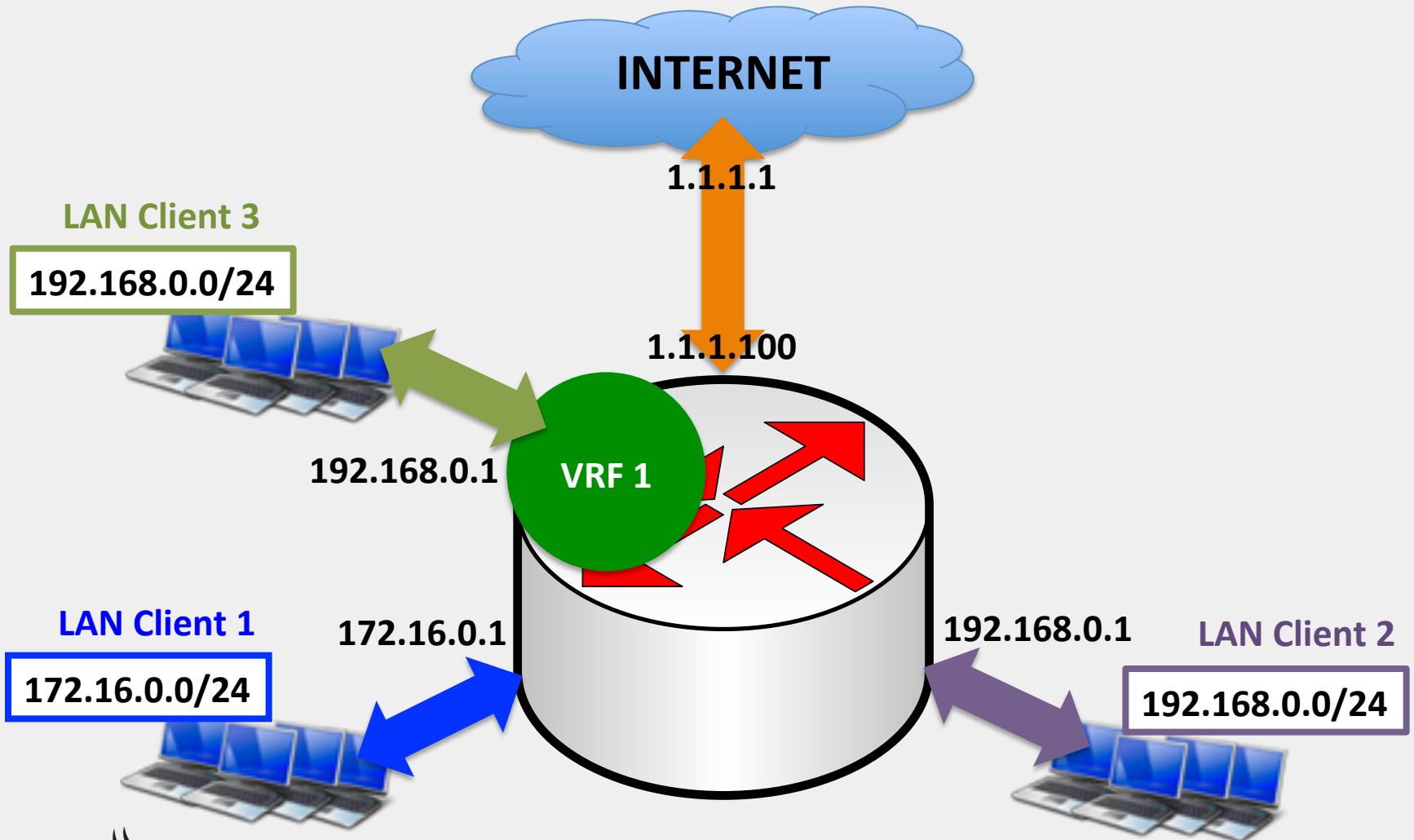
# Solutions

- **Cermati Kebutuhan Client**
  - Apakah client hanya ingin terkoneksi ke internet
  - Apakah client tersebut juga ingin interkoneksi ke client Anda yang lain
- **Ubah “Segmen Network Local” di Client harus berbeda antara satu client dengan client yang lain**
  - Jika client berkenan/mau mengganti semua seting perangkat (PC/Laptop/Printer/server/camera/AP ... ) yang sudah ada dan sudah terlanjur berjalan normal
  - Memerlukan waktu untuk mengganti semua seting perangkat
- **Memanfaatkan NAT di router client**
  - Jika ada budget untuk penambahan router di client
  - Tetap kesulitan Jika ingin memonitor sampai ke dalam jaringan local client (tetap membutuhkan routing)

# Routing – Boundary Problem

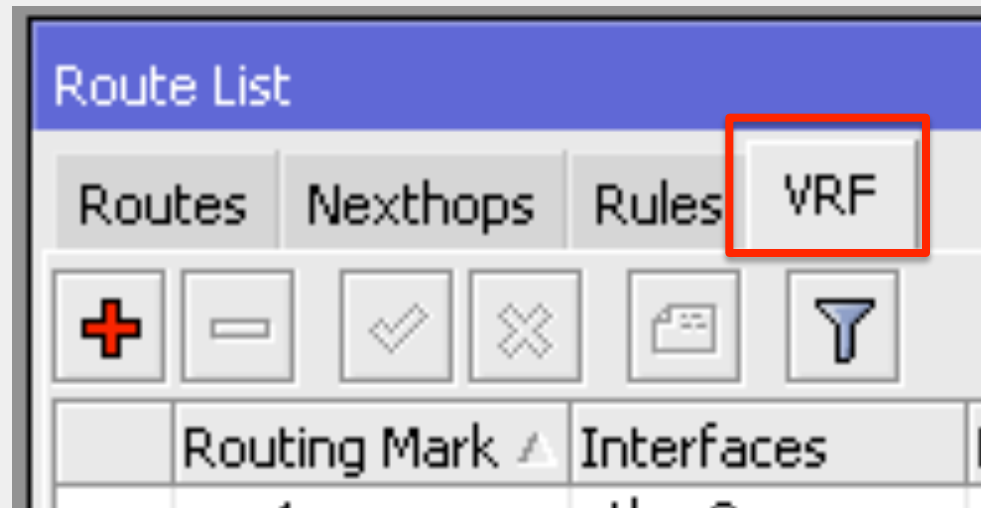
Selama ini kita hanya memanfaatkan Router/  
Routing hanya pada tabel “main”, dan akan  
mendapatkan masalah jika ada dst-network  
yang sama ke gateway / interface yang berbeda.

# Another Solution - VRF



# VRF

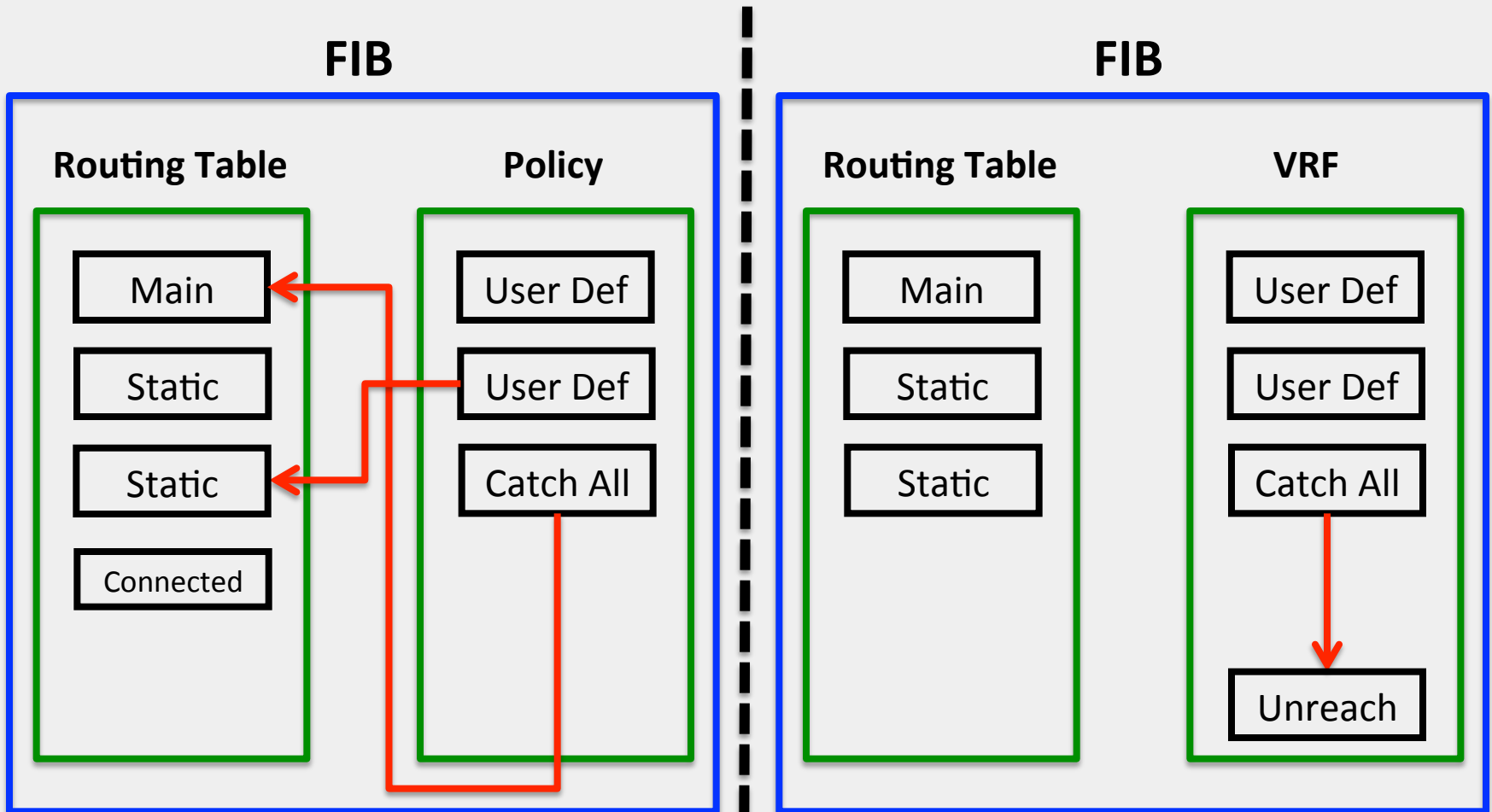
VRF – **Virtual Routing Forwarding** adalah salah satu fitur Routing di Mikrotik yang memungkinkan membuat “Tabel Routing Baru” yang terpisah dari “Routing Table Main”.



# Policy Route vs VRF

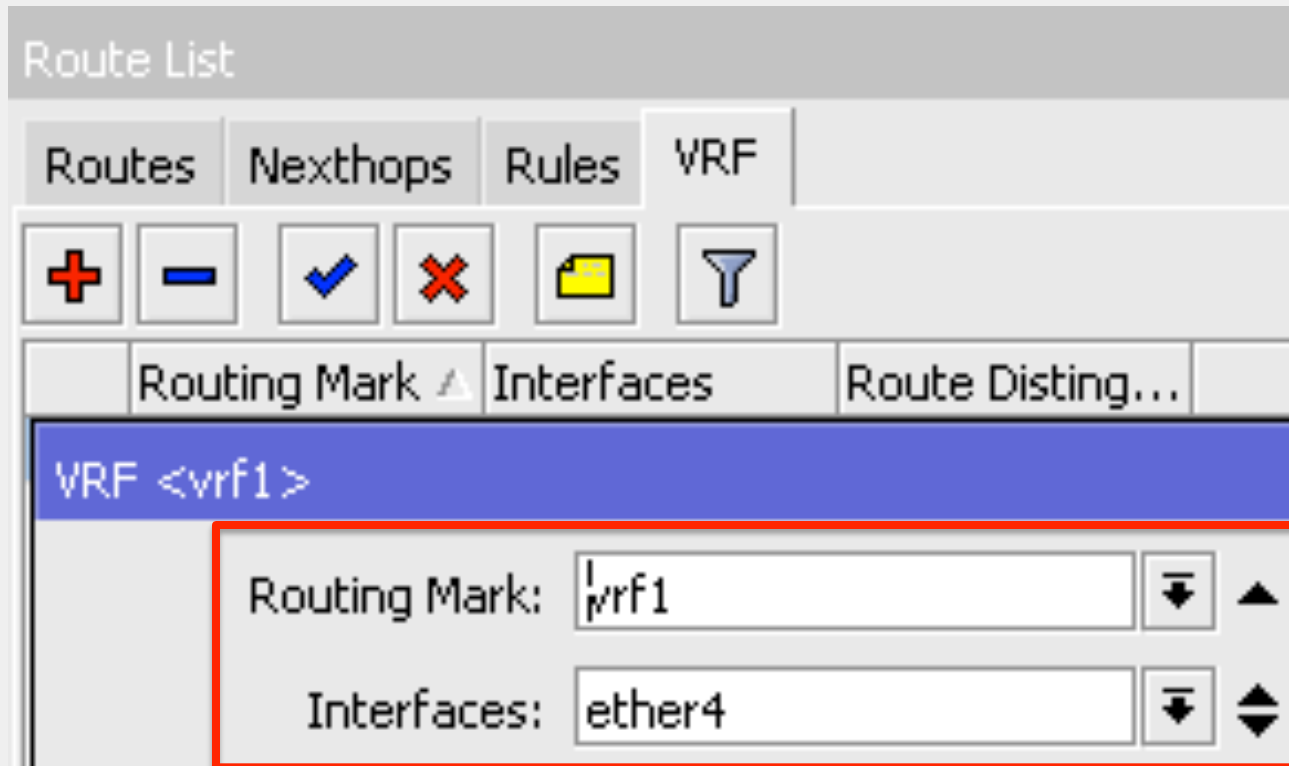
- Cara kerja VRF mirip dengan Policy Route
- Perbedaannya :
  - **Policy Route** akan kembali ke Routing Table Main jika tidak menemukan rule routing / nexthop lookup yang sesuai.
  - **VRF** tidak menggunakan Routing Table Main untuk nexthop lookup dan jika tidak ada routing yang sesuai di dalam VRF tersebut maka akan diberikan pesan error "network unreachable"
- VRF adalah sebuah routing table yang independen, tetapi masih bisa dimodifikasi jika membutuhkan interkoneksi ke routing table yang lain

# Policy Route vs VRF



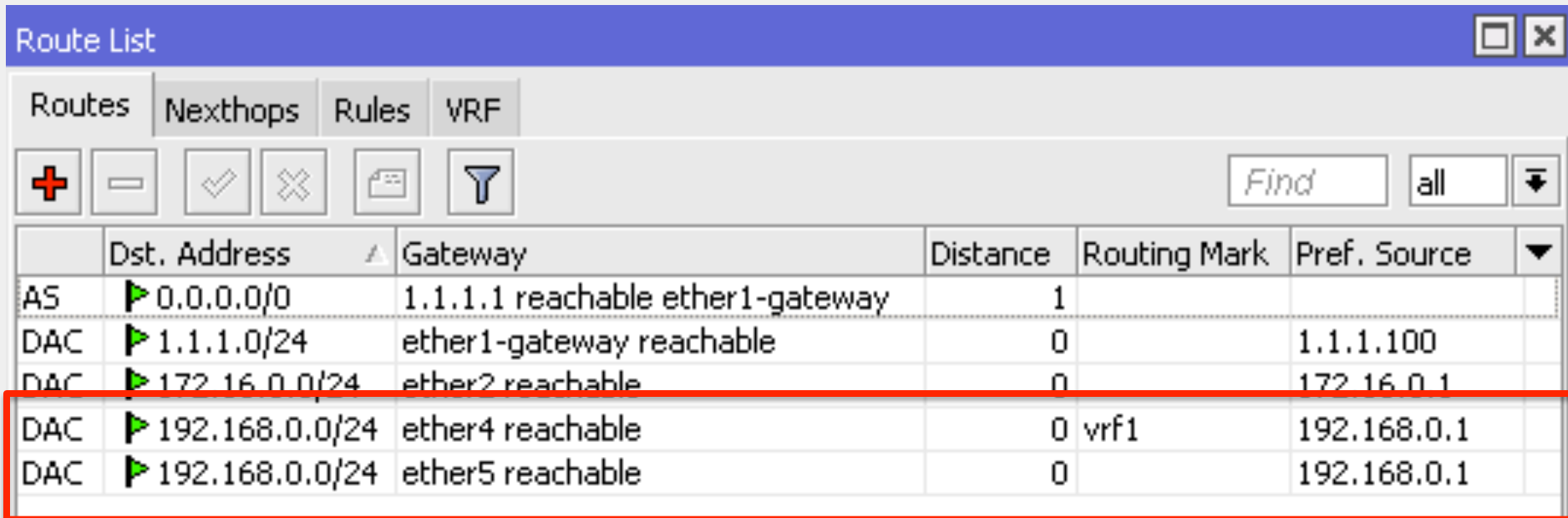


# VRF Implementation



VRF ditambahkan sekaligus memasukkan interface LAN Client ke dalam VRF

# Routing Table



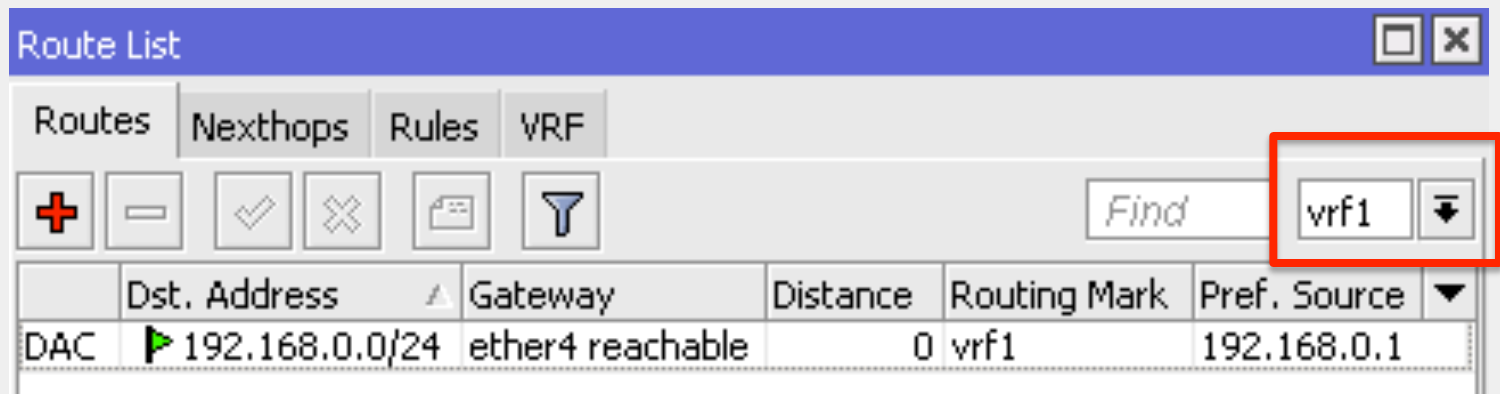
The screenshot shows the 'Route List' window in Mikrotik WinBox. The window has a blue title bar and a toolbar with icons for adding, removing, and filtering routes. Below the toolbar is a table with columns: Dst. Address, Gateway, Distance, Routing Mark, and Pref. Source. The table contains five entries. The last two entries, which are for the 192.168.0.0/24 network, are highlighted with a red border. These entries show a 'vrf1' routing mark, indicating they are part of a VRF.

	Dst. Address	Gateway	Distance	Routing Mark	Pref. Source
AS	0.0.0.0/0	1.1.1.1 reachable ether1-gateway	1		
DAC	1.1.1.0/24	ether1-gateway reachable	0		1.1.1.100
DAC	172.16.0.0/24	ether2 reachable	0		172.16.0.1
DAC	192.168.0.0/24	ether4 reachable	0	vrf1	192.168.0.1
DAC	192.168.0.0/24	ether5 reachable	0		192.168.0.1

Routing Table yang menggunakan VRF

# How to connect to the Internet

- VRF tidak menggunakan table “main” untuk nexthop lookup (tidak memiliki default gateway)
- Supaya VRF bisa ke internet :
  - VRF bisa dihubungkan ke Table “Main” menuju ke gateway Internet - “**Route Leaking**”
  - Menggunakan Gateway Internet yang berbeda



The screenshot shows the Mikrotik WinBox interface for the 'Route List' window. The window title is 'Route List'. There are tabs for 'Routes', 'Nexthops', 'Rules', and 'VRF'. Below the tabs are several icons: a red plus sign, a minus sign, a checkmark, an 'X', a folder icon, and a funnel icon. To the right of these icons is a 'Find' search box containing the text 'vrf1'. A red box highlights the search box and the 'vrf1' dropdown menu. Below the search box is a table with the following columns: 'Dst. Address', 'Gateway', 'Distance', 'Routing Mark', and 'Pref. Source'. The table contains one row with the following data: 'DAC', '192.168.0.0/24', 'ether4 reachable', '0', 'vrf1', and '192.168.0.1'.

	Dst. Address	Gateway	Distance	Routing Mark	Pref. Source
DAC	192.168.0.0/24	ether4 reachable	0	vrf1	192.168.0.1

# Route Leaking Implementation

Route <0.0.0.0/0>

General | Attributes

Dst. Address: 0.0.0.0/0

Gateway: 1.1.1.1@main on main reachable ether1-gateway

Check Gateway:

Type: unicast

Distance: 1

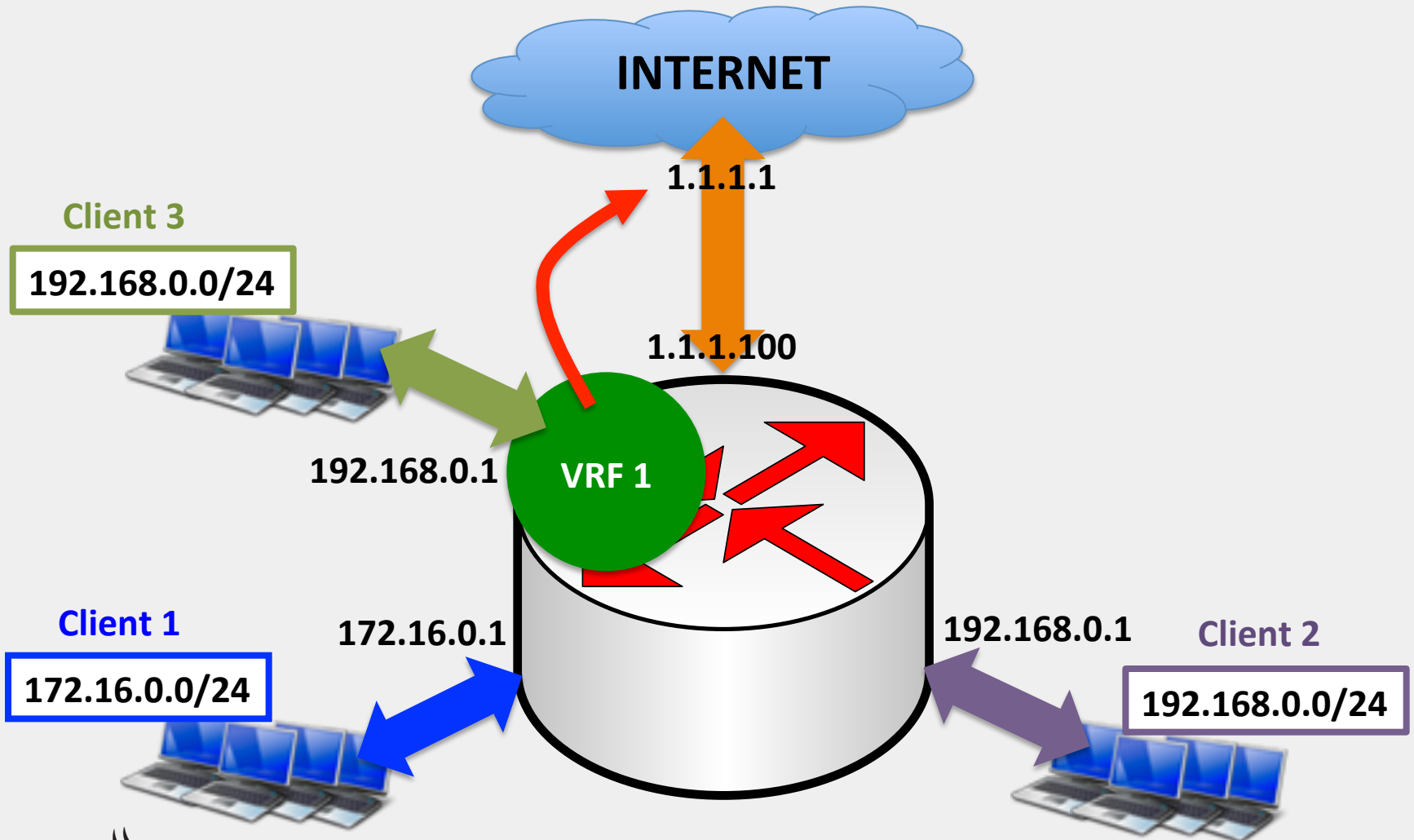
Scope: 30

Target Scope: 10

Routing Mark: vrf1

Pref. Source:

# VRF – Route Leaking



# Route Consistency

- **Route Leaking** hanya membantu mengarahkan traffic request “upload” dari client ke Internet
- Perlu adanya routing yang konsisten untuk traffic response “download”
- Menggunakan “**Policy Route**”

## Mangle Rule <>

General

Advanced

Extra

Action

Statistics

Chain: prerouting

Src. Address:

Dst. Address:

## Mangle Rule <>

General

Advanced

Extra

Action

Statistics

Protocol:

Action: mark connection

Src. Port:

New Connection Mark: con-vrf1

Dst. Port:

Passthrough

Any. Port:

P2P:

In. Interface:  ether4

## Mangle Rule <>

General Advanced Extra Action Statistics

Chain: prerouting

Src. Address:

Dst. Address:

Protocol:

Src. Port:

Dst. Port:

Any. Port:

P2P:

In. Interface:  ether1-gateway

Out. Interface:

Packet Mark:

Connection Mark:  con-vrf1

## Mangle Rule <>

General Advanced Extra Action Statistics

Action: mark routing

New Routing Mark: vrf1

Passthrough



## Mangle Rule <>

General Advanced Extra Action Statistics

Chain: output

Src. Address:

Dst. Address:

Protocol:

Src. Port:

Dst. Port:

Any. Port:

P2P:

In. Interface:

Out. Interface:

Packet Mark:

Connection Mark:  con-vrf1

## Mangle Rule <>

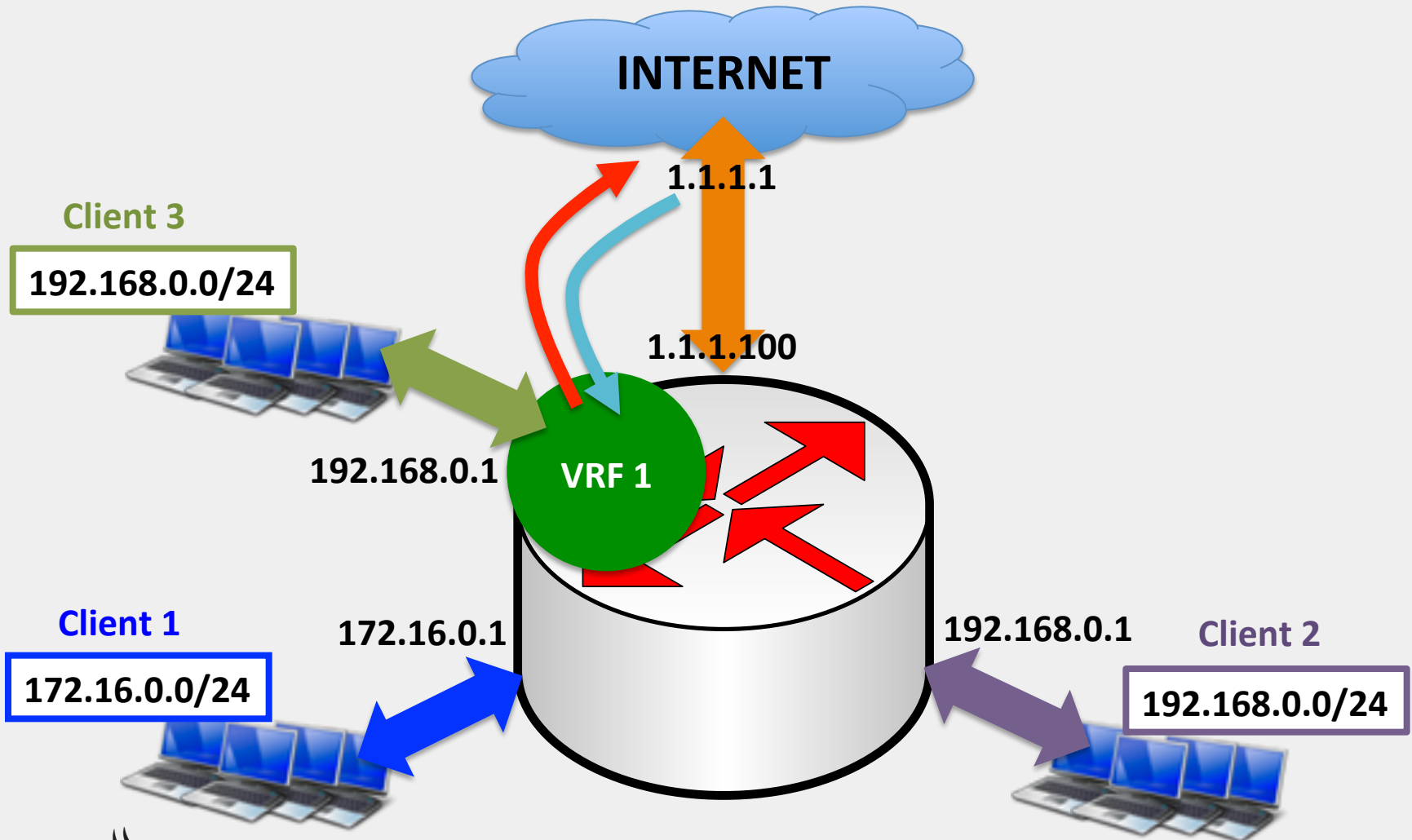
General Advanced Extra Action Statistics

Action: mark routing

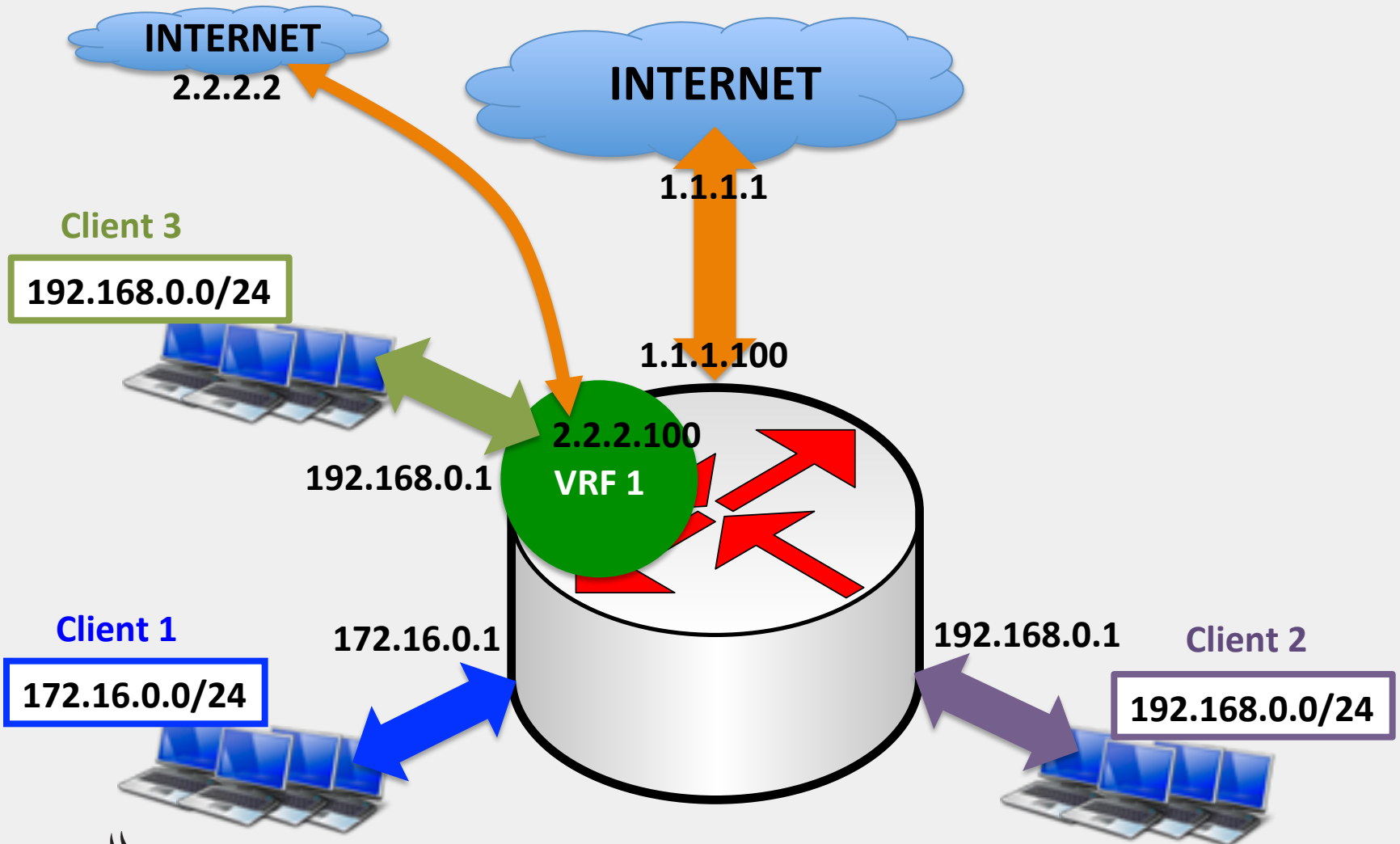
New Routing Mark: vrf1

Passthrough

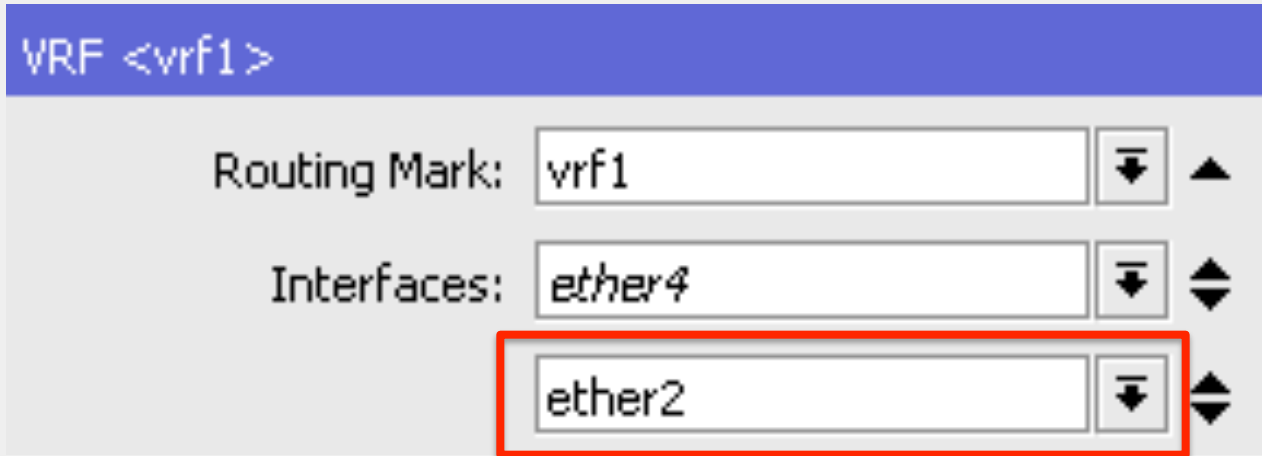
# Routing Consistency



# VRF - Alternative Gateway



# VRF – Alternative Gateway



The screenshot shows the configuration for a VRF named 'vrf1'. The 'Routing Mark' is set to 'vrf1'. Under the 'Interfaces' section, 'ether4' is listed as the primary interface, and 'ether2' is listed below it as an alternative gateway. The 'ether2' entry is highlighted with a red rectangular box.

Tambahkan interface gateway alternatif ke dalam VRF

# VRF – Default Route

Route <0.0.0.0/0>

General | Attributes

Dst. Address: 0.0.0.0/0

Gateway: 2.2.2.2 on vrf1 reachable ether2

Check Gateway:

Type: unicast

Distance: 1

Scope: 30

Target Scope: 10

Routing Mark: vrf1

Default route  
ditambahkan di tabel  
routing VRF

Tambahkan NAT untuk  
Gateway Alternatif

# CONCLUSION

- Korelasi VRF dan VPN :
  - Keduanya menggunakan nama “Virtual” 😊
  - Prinsip VPN adalah membuat virtual network yang terpisah dari real network, ternyata routing juga memiliki kemampuan yang mirip yaitu virtual routing table.
- Keuntungan VRF :
  - Mengatasi permasalahan routing yang bingung ketika ada destination network yang sama di dalam satu tabel routing
  - Client lebih leluasa menggunakan segmen network local, tidak tergantung segmen network local di client yang lain

# CONCLUSION 2

- VRF masih bisa dihubungkan ke Tabel Routing Main atau VRF yang lain dengan Route-Leaking
- Salah satu Solusi jitu dan solusi hemat untuk provider VPN
- Q & A



# Thank You Mas Broo !!

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[@mikrotik\\_id](#) – picture contest

Dijijinkan 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](http://www.mikrotik.co.id)