Jaringan Komputer 2 - STI4433 || 3 SKS

Routing

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Routing – Router !!

- Routing adalah suatu proses penerusan paket data dari suatu jaringan menuju jaringan lainnya. Pengiriman paket pada jaringan dapat diteruskan ke jaringan lainnya melalui mekanisme routing.
- Proses pengambilan keputusan : Jalur / *gateway* yang mana paket data harus dilakukan
- Routing merupakan proses pencarian path atau alur guna memindahkan informasi /data dari host sumber (source address) ke host tujuan (destination address) Melalui koneksi internetwork.

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Routing – Router !!

Routing merupakan fungsi yang bertanggung jawab membawa data melewati sekumpulan jaringan dengan cara memilih jalur terbaik untuk dilewati data

Proses Routing dilakukan device jaringan yang disebut Router

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Routing – Router !!

Routing - Rute - Jalur

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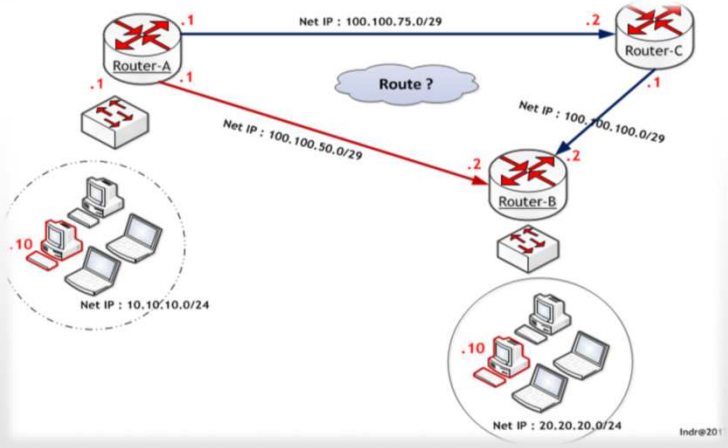
Konsep [Routing - Router]



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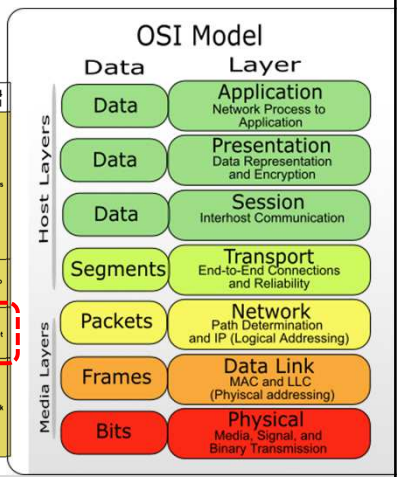
Routing – Router !! OSI Layer

OSI (Open Source Interconnection) 7 Layer Model

Layer	Application/Example		Central Device/ Protocols		DOD4 Model
Application (7) Serves as the window for users and application processes to access the network services.	**End User layer** Program that opens what was sent or creates what is to be sent. Resource sharing • Remote file access • Remote printer access • Directory services • Network management		**User Applications** SMTP		
Presentation (6) Formats the data to be presented to the Application layer. It can be viewed as the "Translator" for the network.	**Syntax layer** encrypt & decrypt (if needed). Character code translation • Data conversion • Data compression • Data encryption • **Character Set Translation**		JPEG/ASCII EBDIC/TIFF/GIF PICT		Process
Session (5) Allows session establishment between processes running on different stations.	**Synch & send to ports** (logical ports). Session establishment, maintenance and termination • Session support - perform security, name recognition, logging, etc.		**Logical Ports** RPC/SQL/NFS NetBIOS names		
Transport (4) Ensures that messages are delivered error-free, in sequence, and with no [illegible]	**TCP** Host to Host, Flow Control. Message segmentation • Message acknowledgement • [illegible]	PACKET FILTERING	TCP/SPX/UDP	GATEWAY Can be used in these layers	Host to Host
Network (3) Controls the operations of the subnet, deciding which physical path the data takes.	**Packets** ("letter", contains IP address). Routing • Subnet traffic control • Frame fragmentation • Logical-physical address mapping • Subnet usage accounting		**Routers** IP/IPX/ICMP		Internet
Data Link (2) Provides error-free transfer of data frames from one node to another over the Physical layer.	**Frames** ("envelopes", contains MAC address) [NIC card — Switch — NIC card] (end to end). Establishes & terminates the logical link between nodes • Frame traffic control • Frame sequencing • Frame acknowledgment • Frame delimiting • Frame error checking • Media access control		**Switch Bridge WAP** PPP/SLIP	Land Based Layers	Network
Physical (1) Concerned with the transmission and reception of the unstructured raw bit stream over the physical medium.	**Physical structure** Cables, hubs, etc. Data Encoding • Physical medium attachment • Transmission technique - Baseband or Broadband • Physical medium transmission Bits & Volts		**Hub**		



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Static Routing – Dynamic Routing

Static Routing merupakan teknik routing yang mengharuskan Administrator jaringan menyusun tabel routing secara manual. Administrator jaringan harus mengisikan entry route untuk menuju remote network, beserta gateway (next hop) yang dapat digunakan router untuk mencapai remote network tersebut.

Dynamic routing merupakan fungsi routing protocol yang berkomunikasi dengan router yang lain untuk saling memperbaharui / update tabel routing yang ada, sehinggan administrator tidak perlu melakukan update jalur (path) jika terjadi perubahan jalur transmisi (path). Dynamic routing umumnya digunakan untuk jaringan komputer yang besar dan lebih kompleks.

Static Routing VS Dynamic Routing → Penggunaan !

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Dynamic Routing

- ✓ *Dynamic routing* merupakan fungsi dari *routing protocol* yang berkomunikasi dengan router yang lain untuk saling memperbaharui (update) tabel routing yang ada. Dengan demikian, administrator tidak perlu melakukan *updating* jalur (path) jika terjadi perubahan jalur transmisi (path). *Dynamic routing* umumnya digunakan untuk jaringan komputer yang besar dan lebih kompleks.

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Static Routing – Dynamic Routing

Dynamic Routing
- RIP [Routing Information Protocol]
- OSPF [Open Shortest Path First]
- IGRP [Internal Gateway Routing Protocol]
- EIGRP [Enhanced Internal Gateway Routing Protocol]
- BGP [Border Gateway Protocol]

Algoritma Routing
- Distance Vector → RIP, IGRP, EIGRP
- Link state Routing → OSPF

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OSPF (Open Shortest Path First)

- OSPF adalah routing protokol jenis IGRP (Interior Gateway Routing Protocol) yang hanya dapat bekerja dalam jaringan internal suatu organisasi/ perusahaan.
- Jaringan internal maksudnya adalah jaringan administrator memiliki hak untuk menggunakan, mengatur, dan memodifikasinya [hak administrasi].
- OSPF merupakan routing protokol yang menggunakan konsep hirarki routing, dengan menggunakan sistem pengelompokan area

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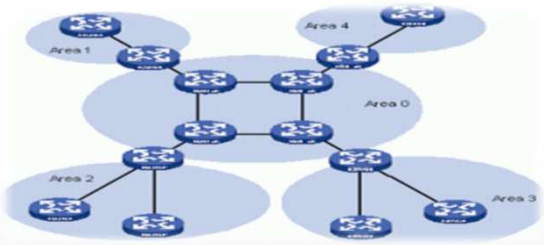
OSPF (Open Shortest Path First)



Dengan konsep hirarki routing [Area], penyebaran informasinya menjadi lebih teratur dan tersegmentasi

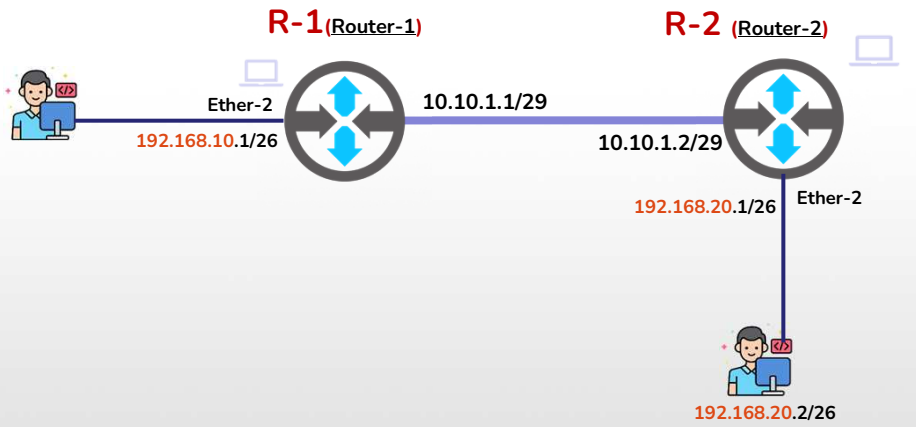
Mekanisme → istilah "hello protocol"

Hello packet dikirimkan secara berkala setiap *10 detik (media Broadcast Multiaccess) dan setiap 30 detik pada Point -to-Point.* → menggunakan protocol multicast

Default Distance Value Table

Administrative Distance Route Source	Default Distance
Connected interface	0
Static route	1
Enhanced IGRP summary route	5
External BGP	20
Internal Enhanced IGRP	90
IGRP	100
OSPF	110
IS-IS	115
RIP	120
EIGRP external route	170
Internal BGP	200
Unknown	255

Topologi Static Routing



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Static Routing - Table Routing

Entry Route pada Tabel Routing secara manual pada setiap router yang ada dalam jaringan.

- Untuk Mengetahui network tujuan [remote network] dan bagaimana cara mencapainya
- Informasi dalam tabel routing :
  - ✓ Network address : merupakan informasi network address dari network yang akan dituju [remote network].
  - ✓ Subnetmask / Prefix, merupakan prefix/subnetmask dari network yang akan dituju
  - ✓ Nexthop/gateway : memberikan informasi kepada router, bagaimana mencapai network tujuan

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Konfigurasi Routing Static

#Setting IP Route - Router-1

[indra@router1]> ip route add dst-address 192.168.20.0/24 gateway=10.10.1.2

#Setting IP Route - Router-2

[indra@router2]> ip route add dst-address 192.168.10.0/24 gateway=10.10.1.1

#Report Konfigurasi IP Route - masing-masing router
[indra@router1]> ip route print
[indra@router2]> ip route print

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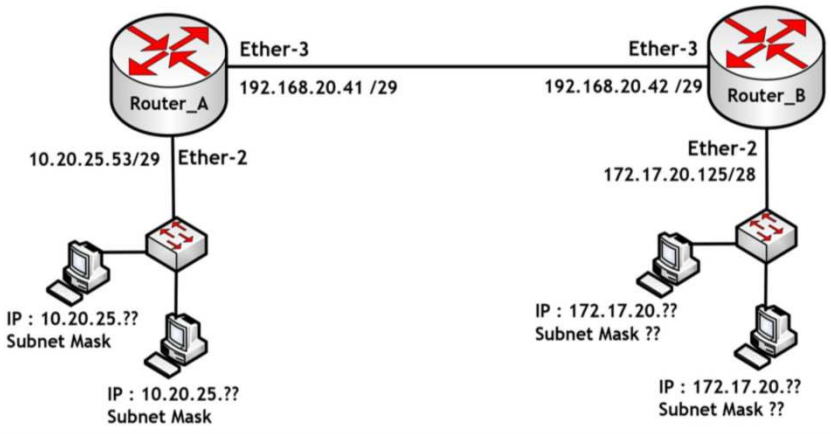
Latihan contoh kasus routing Static



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Latihan contoh kasus routing Static

Berdasarkan topologi tersebut tentukan & buatlah konfigurasi static routing / table routing berdasarkan contoh pada

- ✓ Menentukan Network address : merupakan informasi network address dari network yang akan dituju [remote network].
- ✓ Menentukan Subnetmask / Prefix, merupakan prefix/subnetmask dari network yang akan dituju
- ✓ Menentukan Nexthop/gateway : memberikan informasi kepada router, bagaimana mencapai network tujuan
- ✓ Menentukan IP PC/Host untuk Router-A dan Router-B
- ✓ Menentukan IP Subnet Mask untuk Router-A dan Router-B

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Dynamic Routing – Routing Information Protocol

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Routing Information Protocol [RIP]

Karakteristik RIP

- ✓ Routing Information Protocol merupakan protocol routing dinamis
- ✓ Menggunakan Algoritma Bellman Ford
- ✓ Protocol Routing Distance Vector [Arah & Jarak]
- ✓ Metric Routing Menggunakan Hop Count [Lompatan network]
- ✓ Hop Count 16 Invalid Network

- ✓ Routing Update / pengiriman informasi routing ke router tetangga dilakukan setiap 30 detik secara broadcast
- ✓ Protocol UDP port 520 untuk melakukan pengiriman routing update
- ✓ Merupakan Classfull Routing [RIP V1]
- ✓ Merupakan Classless Routing [RIP V2]
- ✓ Nilai AD [Administrative Distance] 120
- ✓ Menggunakan Split Horizon , Route Poisoning & Hold Down timer untuk mencegah routing loop

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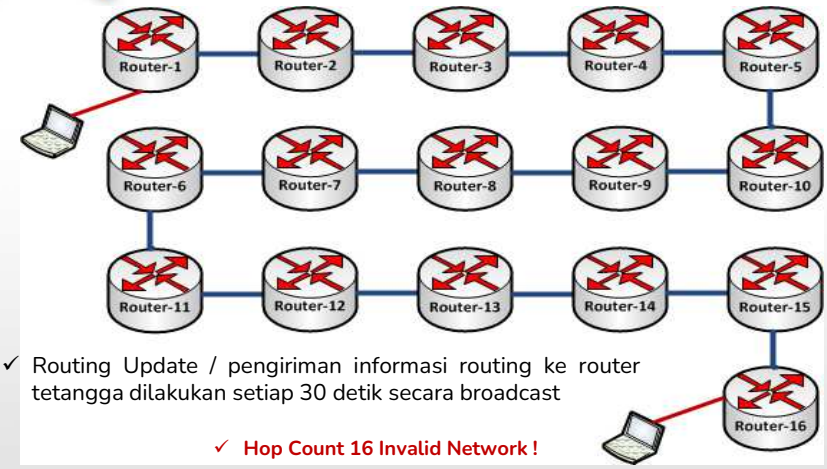
RIP – Hop Count



- ✓ Routing Update / pengiriman informasi routing ke router tetangga dilakukan setiap 30 detik secara broadcast
- ✓ Hop Count 16 Invalid Network !

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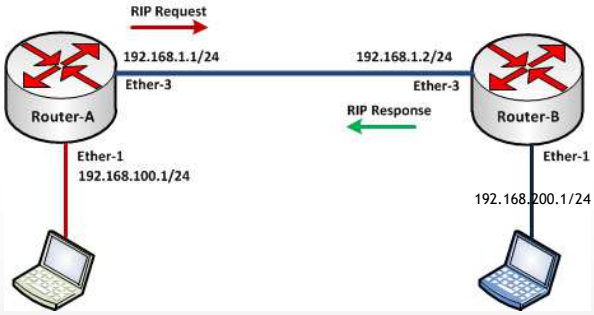
Konfigurasi RIP V2




```
[admin@Router-A] > ip address add address=192.168.1.1/24 interface=ether3
[admin@Router-A] > ip address add address=192.168.100.1/24 interface=ether1
[admin@Router-A] > routing rip interface add interface=ether3 send=v2 receive=v2
[admin@Router-A] > routing rip interface print
Flags: I - invalid, X - disabled, P - passive
 #   INTERFACE          SEND RECEIVE AUTHENTICATION AUTHENTICATION-KEY
 0   ether3             v2   v2      none
```

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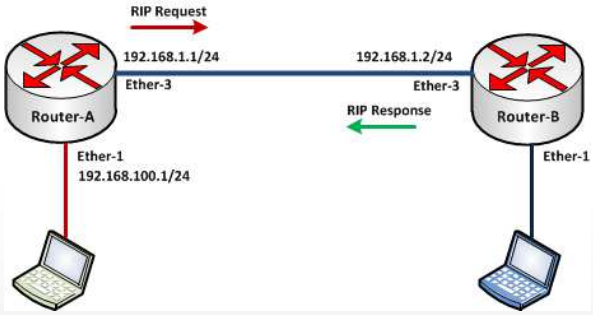
Konfigurasi RIP V2




```
[admin@Router-B] > ip add add address=192.168.200.1/24 interface=ether1
[admin@Router-B] > ip add add address=192.168.1.2/24 interface=ether3
[[admin@Router-B] > routing rip interface add interface=ether3 send=v2 receive=v2
[admin@Router-B] > routing rip interface print
Flags: I - invalid, X - disabled, P - passive
 #   INTERFACE          SEND RECEIVE AUTHENTICATION AUTHENTICATION-KEY
 0   ether3             v2   v2      none
```

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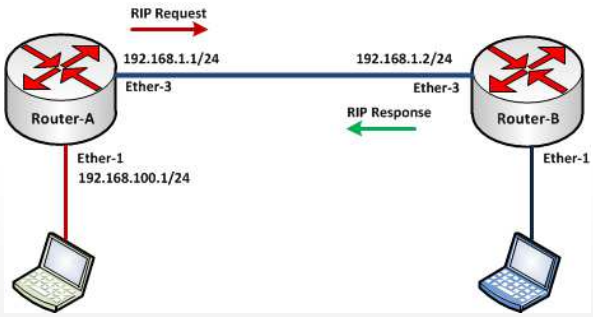
Konfigurasi RIP V2 # Advertise Network




```
[admin@Router-A] > routing rip network add network=192.168.100.0/24
[admin@Router-A] > routing rip network add network=192.168.1.0/24

[admin@Router-B] > routing rip network add network=192.168.200.0/24
[admin@Router-B] > routing rip network add network=192.168.1.0/24
```

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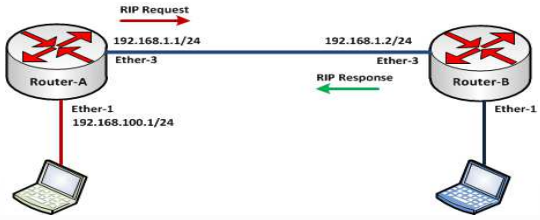
Konfigurasi RIP V2 # Routing RIP




```
C:\Users\indra>tracert 192.168.200.254

Tracing route to [redacted]-PC [192.168.200.254]
over a maximum of 30 hops:

  1     6 ms     2 ms     6 ms  192.168.100.1
  2     1 ms     1 ms     1 ms  192.168.1.2
  3     1 ms     1 ms     1 ms  [redacted]-PC [192.168.200.254]

Trace complete.
```

```
C:\Users\xnote>tracert 192.168.100.254

Tracing route to DESK[redacted] [192.168.100.254]
over a maximum of 30 hops:

  1     1 ms     1 ms    <1 ms  192.168.200.1
  2     1 ms     1 ms    <1 ms  192.168.1.1
  3     6 ms     4 ms     4 ms  DESK[redacted] [192.168.100.254]

Trace complete.
```

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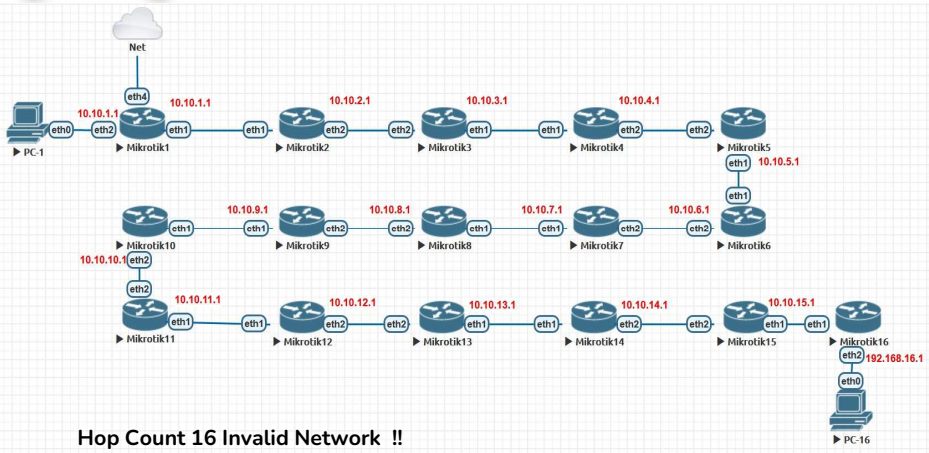
Konfigurasi RIP V2 # Routing RIP



Hop Count 16 Invalid Network !!

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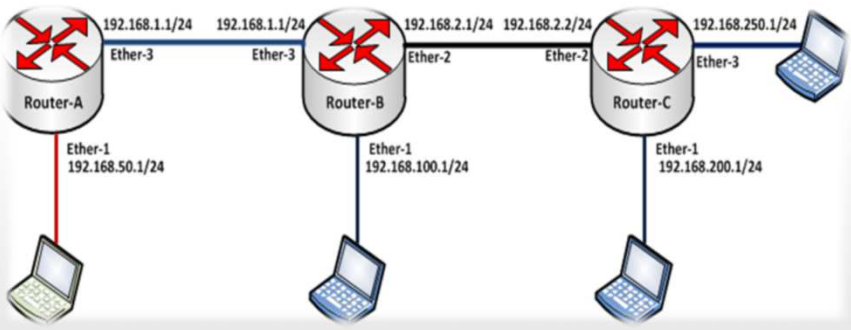
Latihan / Contoh Kasus RIP V2 # Routing RIP !!



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