

Load Balancing Using iBGP Routing



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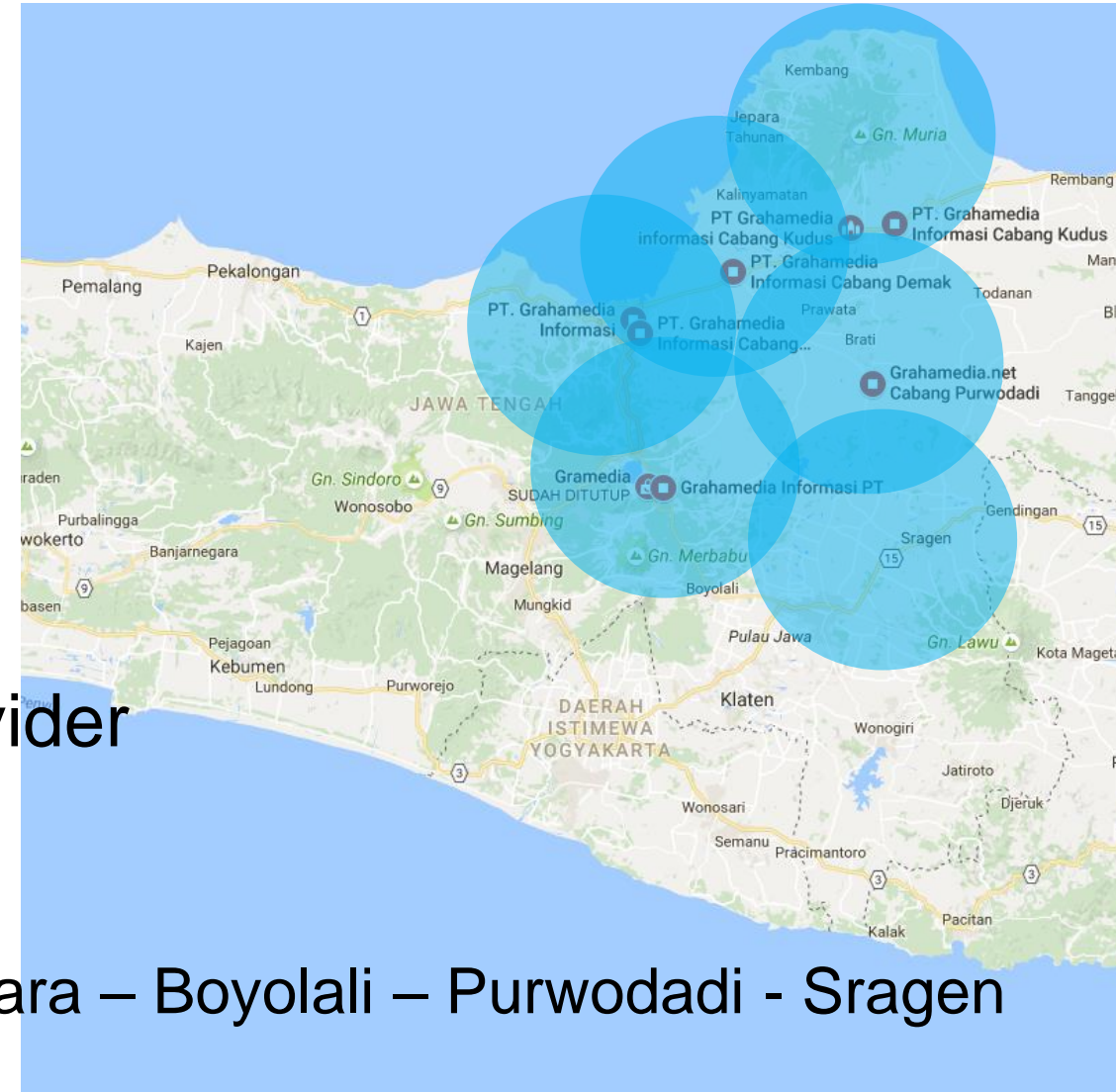
Mikrotik User Meeting

Yogyakarta – Indonesia

2017

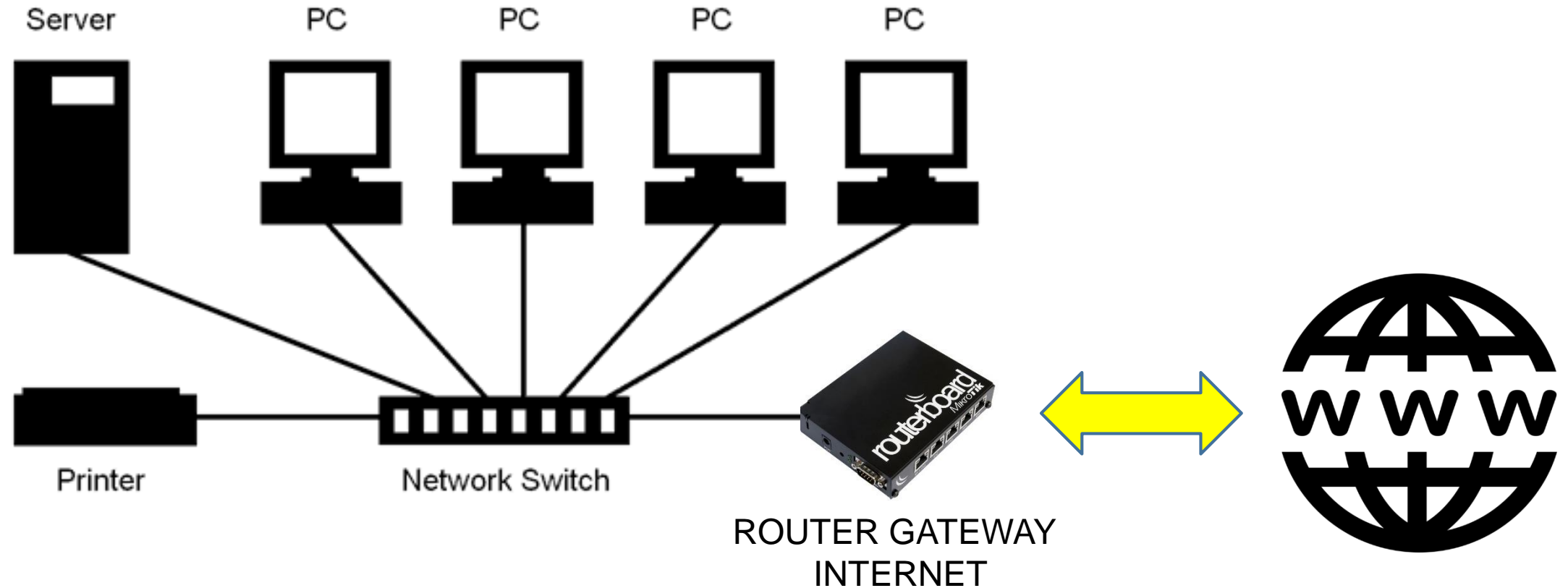
About Presenter

- Irvan Adrian Kristiono
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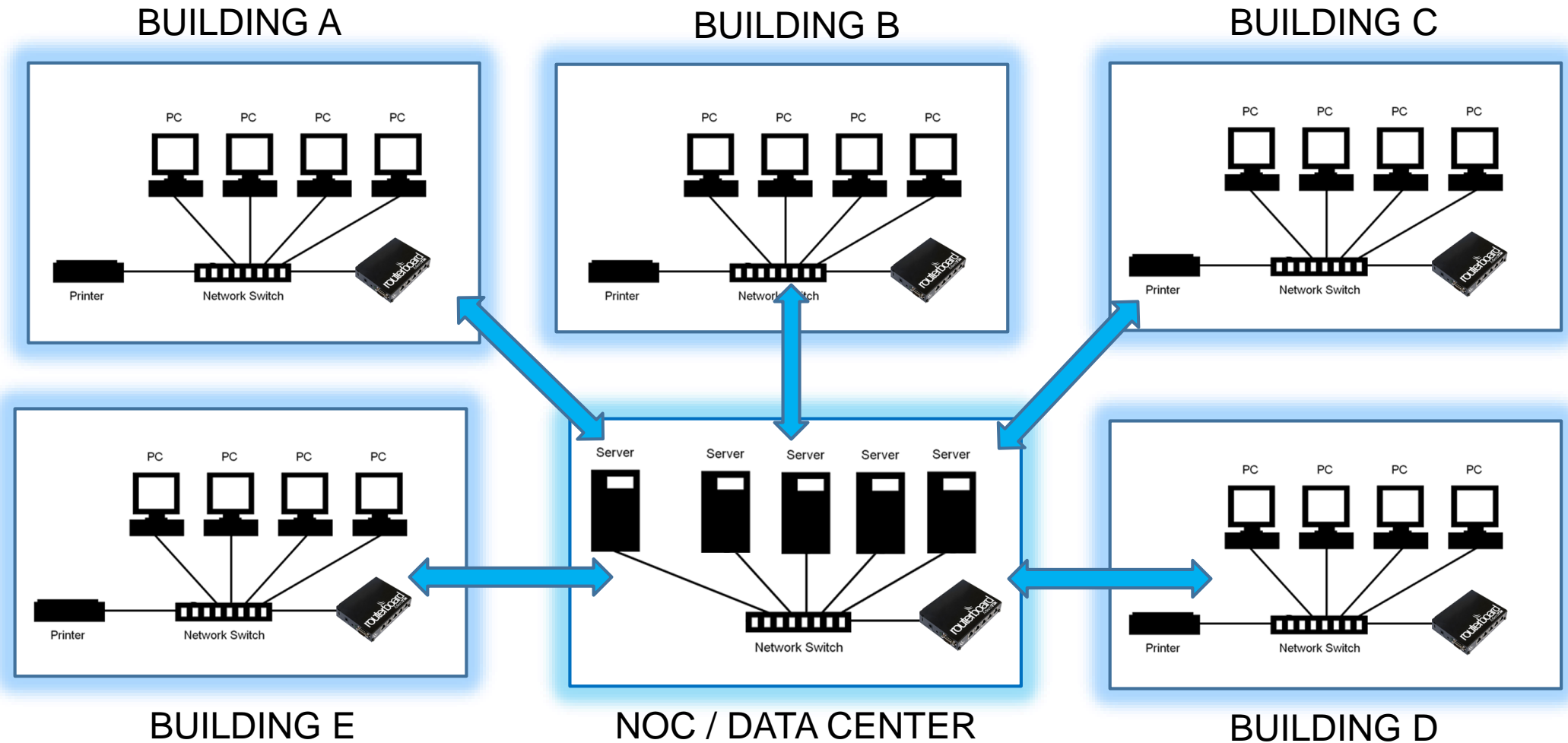


LOAD BALANCING

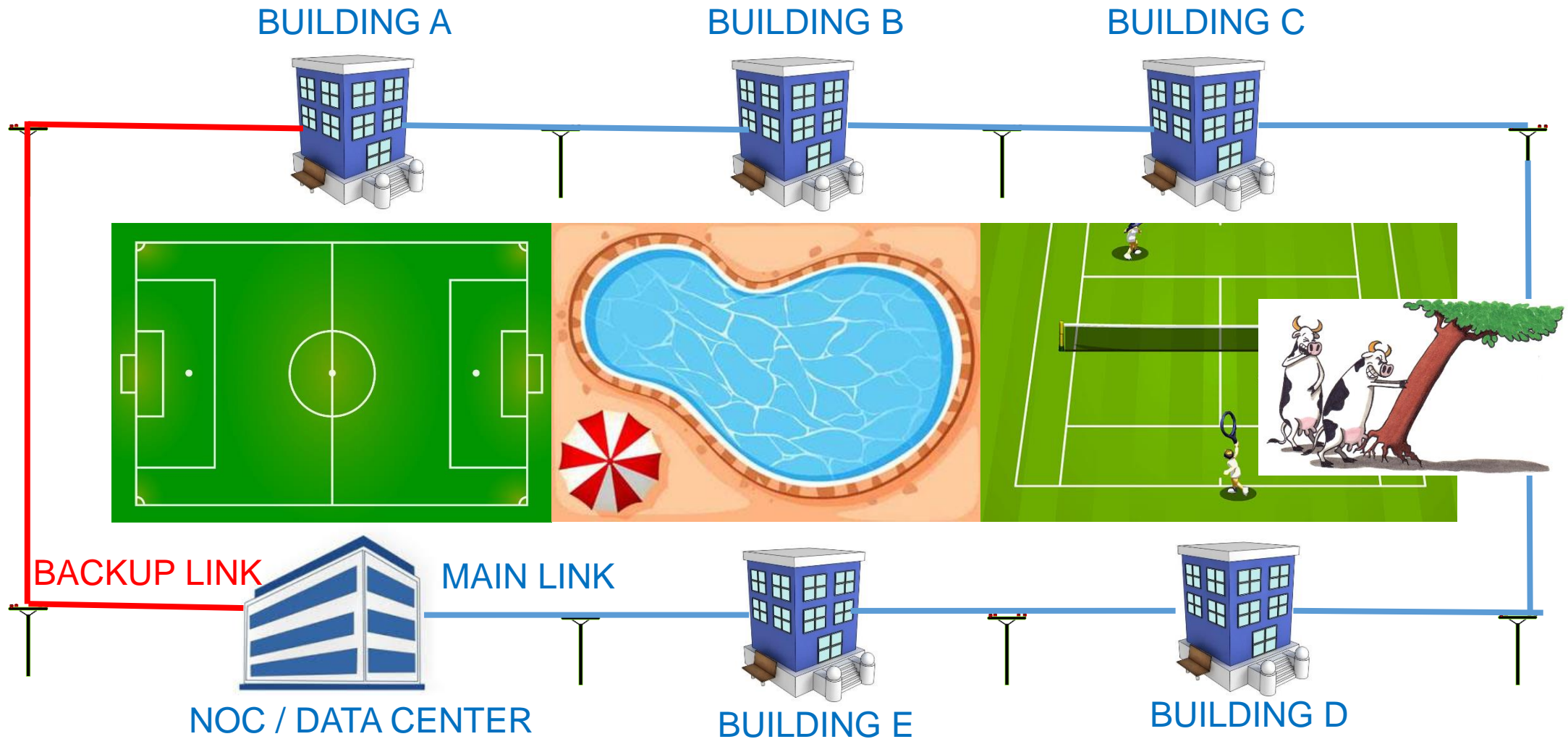
SIMPLE NETWORK LAN



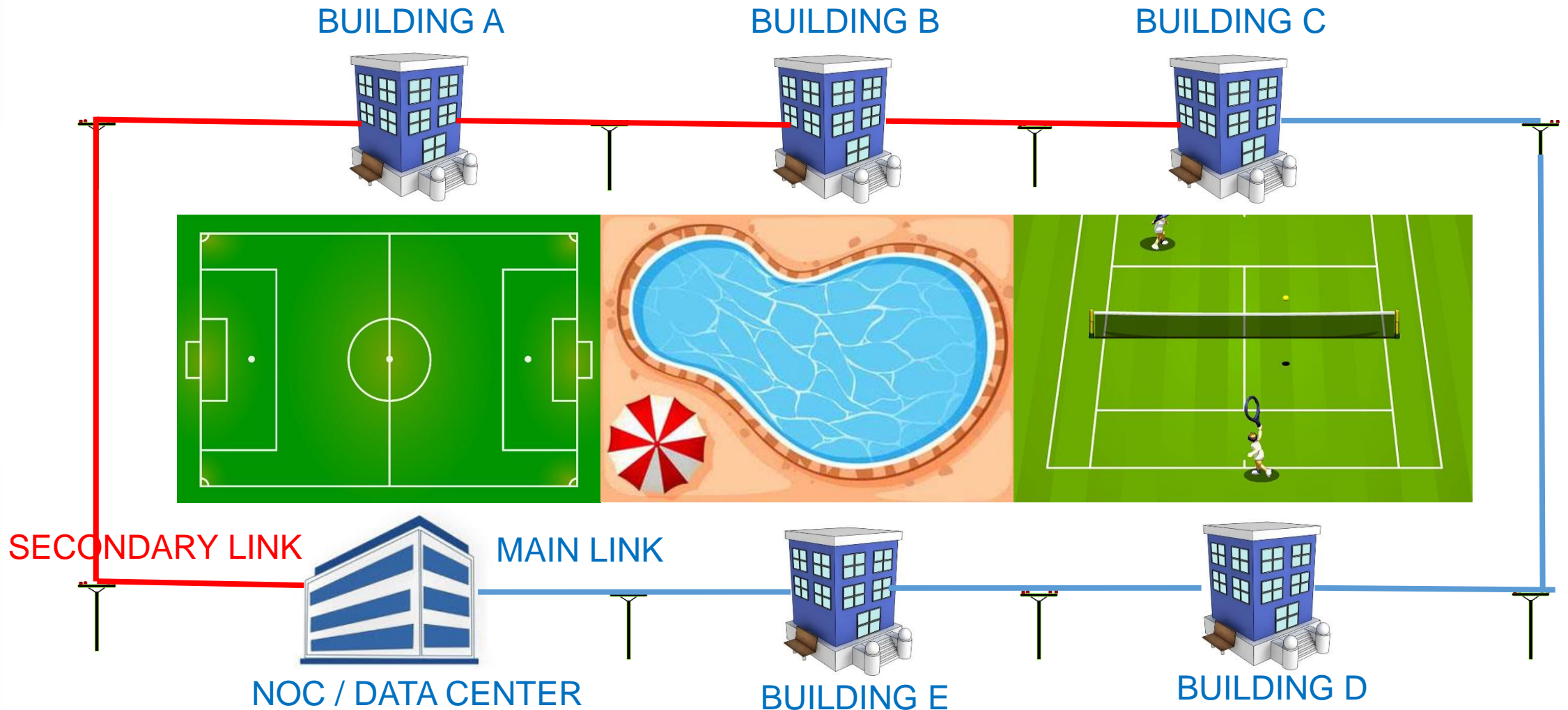
MULTIPLE LAN CONNECTION - STAR



BUS NETWORK

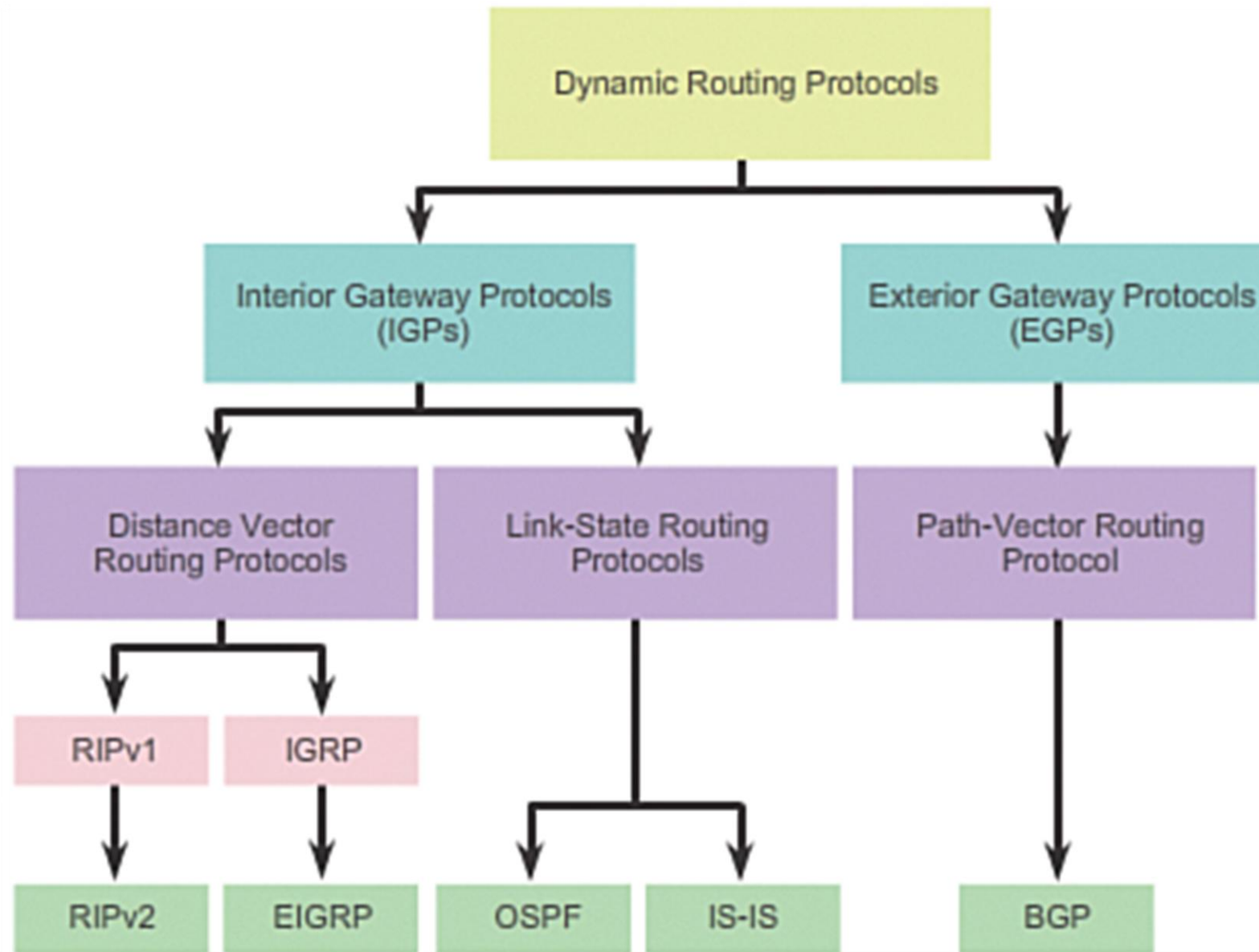


LOAD BALANCING – BUS NETWORK

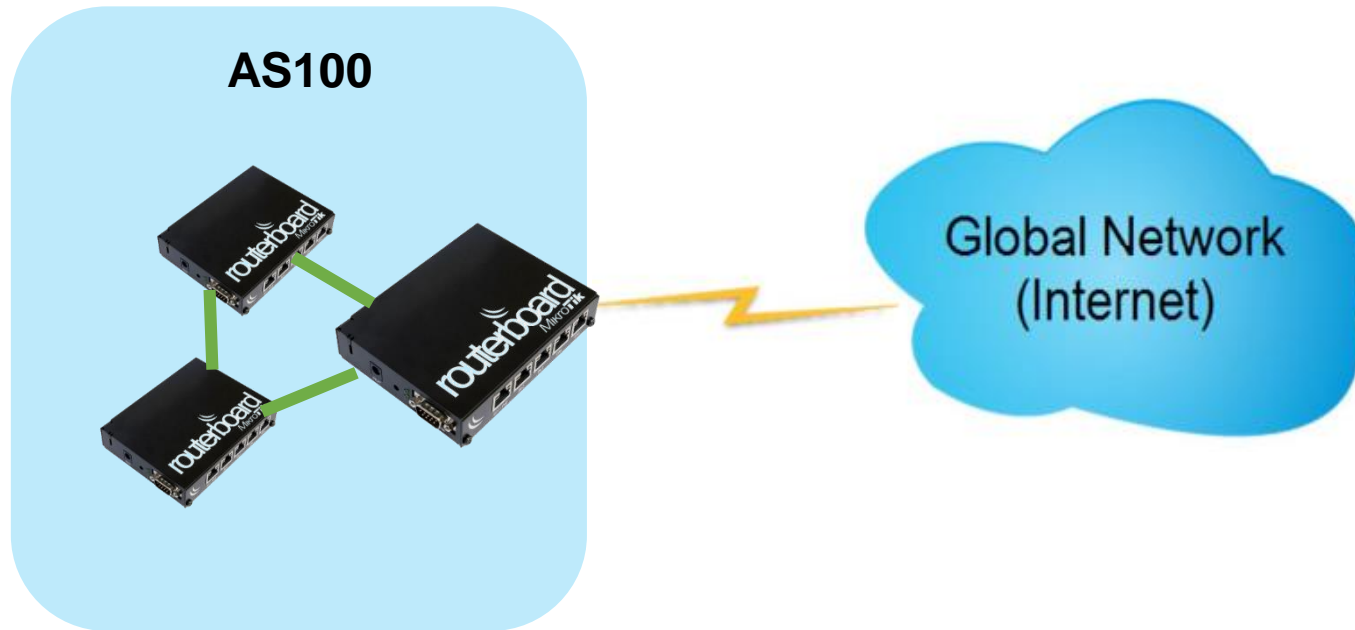


DYNAMIC ROUTING

DYNAMIC ROUTING

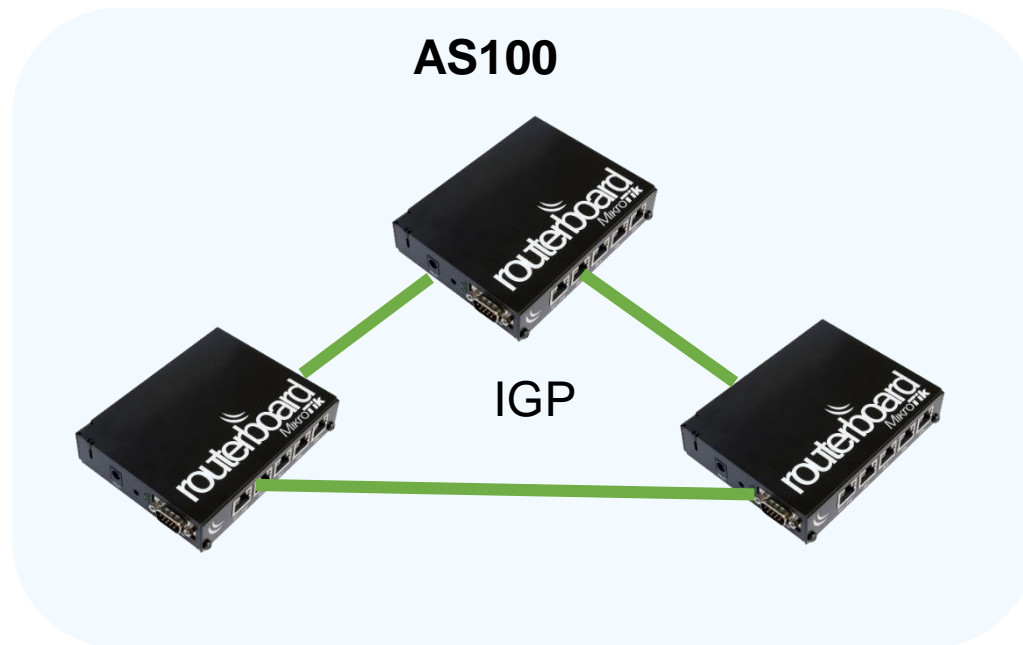


AUTONOMOUS SYSTEM



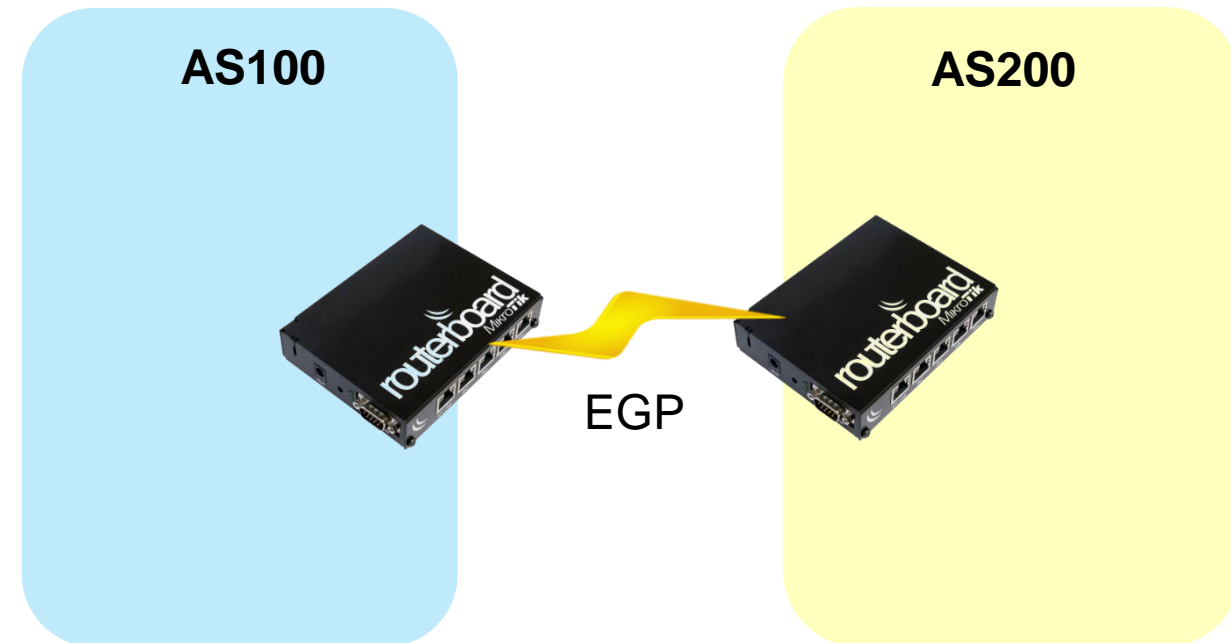
DYNAMIC ROUTING

- INTERIOR GATEWAY PROTOCOL



- RIP, OSPF

- EXTERIOR GATEWAY PROTOCOL



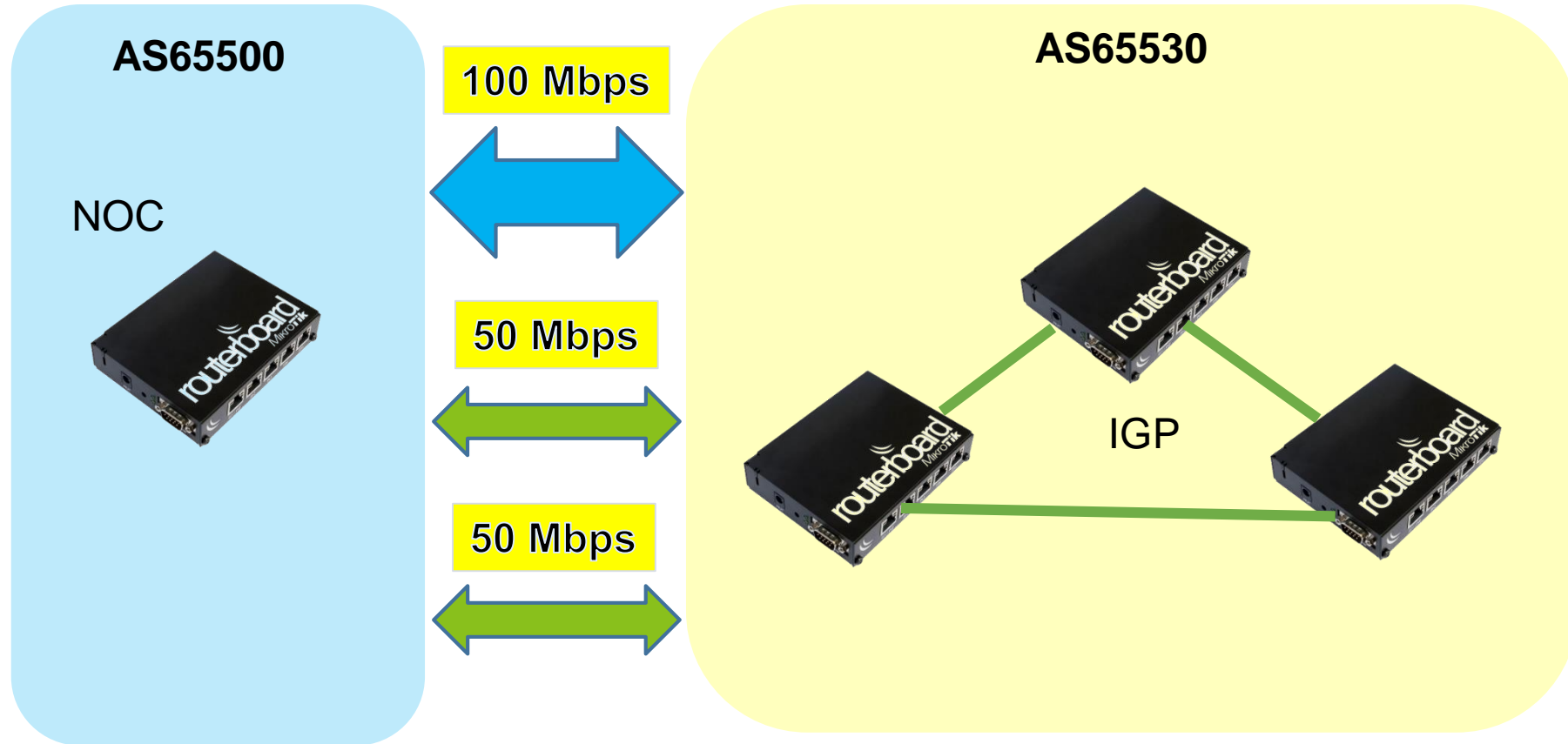
- BGP

Default Administrative Distance

Route Source	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
EGP	140
External Enhanced IGRP	170
Internal BGP	200
Unknown	255

Why iBGP ?

MAIN CAPACITY \neq SECONDARY CAPACITY



INTERNAL BGP (iBGP)

- Antar Router tidak perlu terkoneksi langsung (Directly Connected)
- **iBGP harus terkoneksi Full Mesh :**
 - Membantu Remote Network menggunakan Best Path
 - Redundant koneksi diantara peer Internal
- iBGP peer tidak meng Advertise kembali Network yang dipelajari dari peer internal lainnya.
(harus menggunakan eBGP peer)
- **iBGP akan menjadi penentu keputusan external peer mana yang digunakan untuk mencapai remote network**

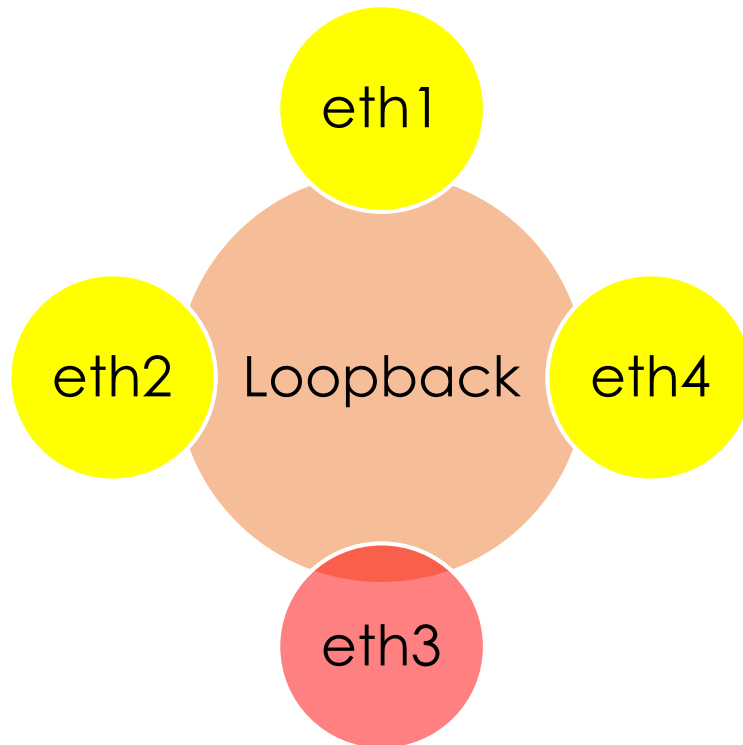
IP iBGP Peering

- Peering dengan menggunakan IP Address disalah satu interface, menyebabkan ketergantungan terhadap salah satu link fisik.
- Jika link tersebut putus, Peer iBGP akan down, IP akan tidak teradvertise.
- Untuk fail over peering antar router iBGP, harus menggunakan IP Loopback

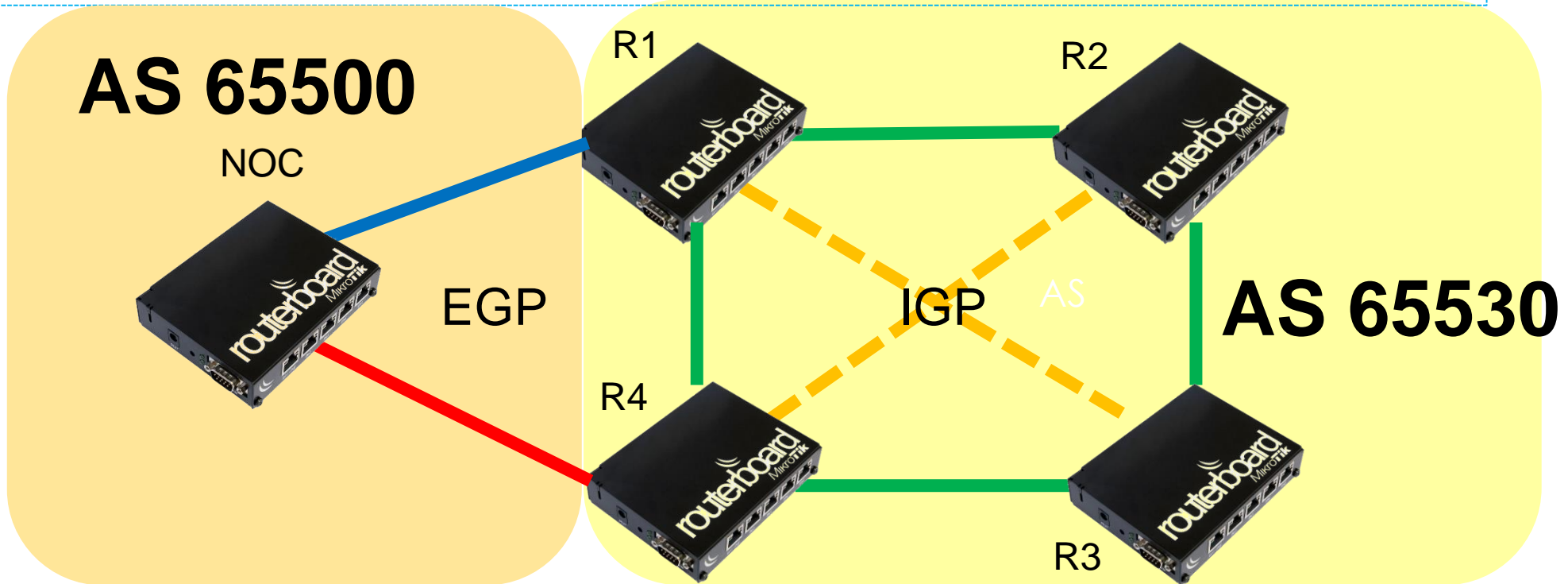
LOOP BACK

- iBGP dan OSPF menggunakan Alamat IP loopback untuk interkoneksi antar peer, mengapa ?

Karena Interface Loopback tidak akan down

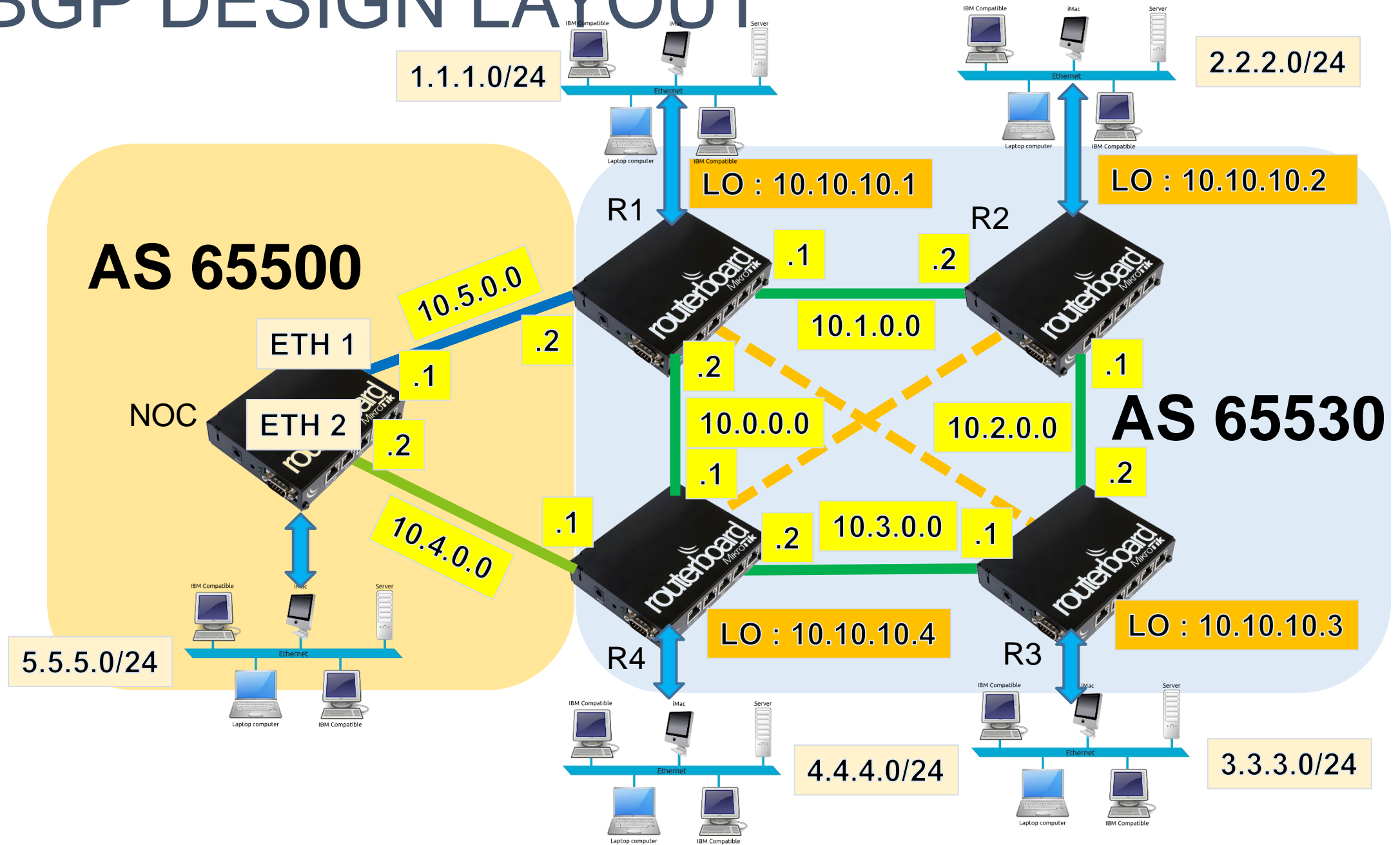


iBGP Design Plan



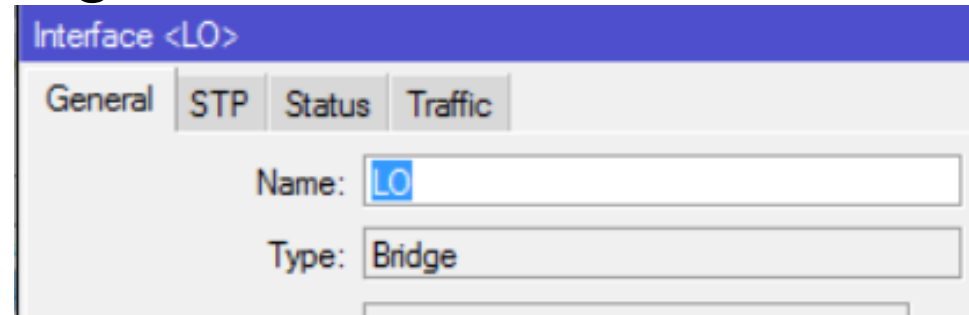
- Full Mesh Peer dalam 1 ASN
- Menggunakan OSPF sebagai IGP
- iBGP untuk memilih Best Path untuk akses ke Internet / Data Center

iBGP DESIGN LAYOUT



SETUP LOOPBACK INTERFACE

- Buat interface “bridge-LO”



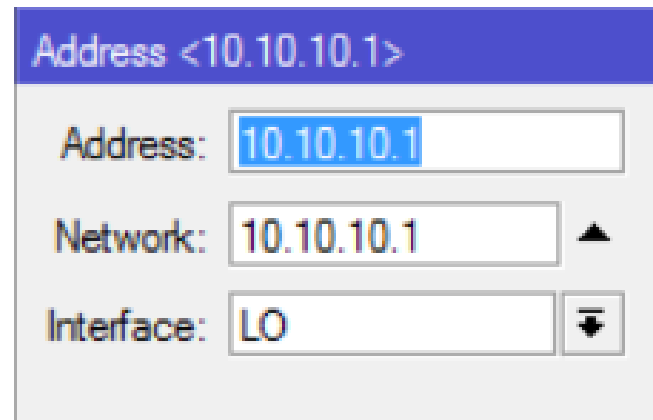
Interface <LO>

General STP Status Traffic

Name: LO

Type: Bridge

- Tambahkan IP Loopback di “bridge-LO”



Address <10.10.10.1>

Address: 10.10.10.1

Network: 10.10.10.1

Interface: LO



INSTALL OSPF (IGP)

OSPF Instance <default>

General Metrics MPLS Status

Name:

Router ID:

OSPF

Instances Networks Areas Area Ranges Virtual Links Neighbors

+ - ✓ ✗ [icon] [filter]

Network	Area
10.1.0.0/30	backbone
10.4.0.0/30	backbone
10.10.10.1	backbone

OSPF

Virtual Links Neighbors NBMA Neighbors Sham Links LSA Routes AS Border Routers ...

[filter]

Instance	Router ID	Address	Interface	State Changes
default	10.10.10.2	10.1.0.2	ether1	6



INSTALL iBGP

BGP Instance <default>

Name:

AS:

Router ID:



BGP												
Instances VRFs Peers Networks Aggregates VPN4 Routes Advertisements												
+ - ✓ ✗ [icon] Refresh Refresh All Resend Resend All												
Name	Instance	Remote Address	Remote AS	M...	R...	TTL	Remote ID	Uptime	Prefix Co...	State		
NOC	default	10.5.0.1	65500	no	no	d...	10.10.10.5	00:00:04	5	established		
R2	default	10.10.10.2	65530	no	no	d...	10.10.10.2	00:06:01	5	established		
R3	default	10.10.10.3	65530	no	no	d...	10.10.10.3	00:05:50	5	established		
R4	default	10.10.10.4	65530	no	no	d...	10.10.10.4	00:05:54	7	established		



IP ROUTE

Route List		
Routes	Nexthops	Rules
+ - ✓ ✕ [icon] [icon]		
	Dst. Address /	Gateway
DAb	▶ 1.1.1.0/24	10.10.10.1 recursive via 10.2.0.1 ether2
DAb	▶ 2.2.2.0/24	10.10.10.2 recursive via 10.2.0.1 ether2
DAC	▶ 3.3.3.0/24	LAN reachable
DAb	▶ 4.4.4.0/24	10.10.10.4 recursive via 10.3.0.2 ether1
DAb	▶ 5.5.5.0/24	10.10.10.1 recursive via 10.2.0.1 ether2
Db	▶ 5.5.5.0/24	10.10.10.4 recursive via 10.3.0.2 ether1
Db	▶ 10.0.0.0/24	10.10.10.2 recursive via 10.2.0.1 ether2
DAC	▶ 10.0.0.0/24	10.10.10.2 recursive via 10.2.0.1 ether2

R3

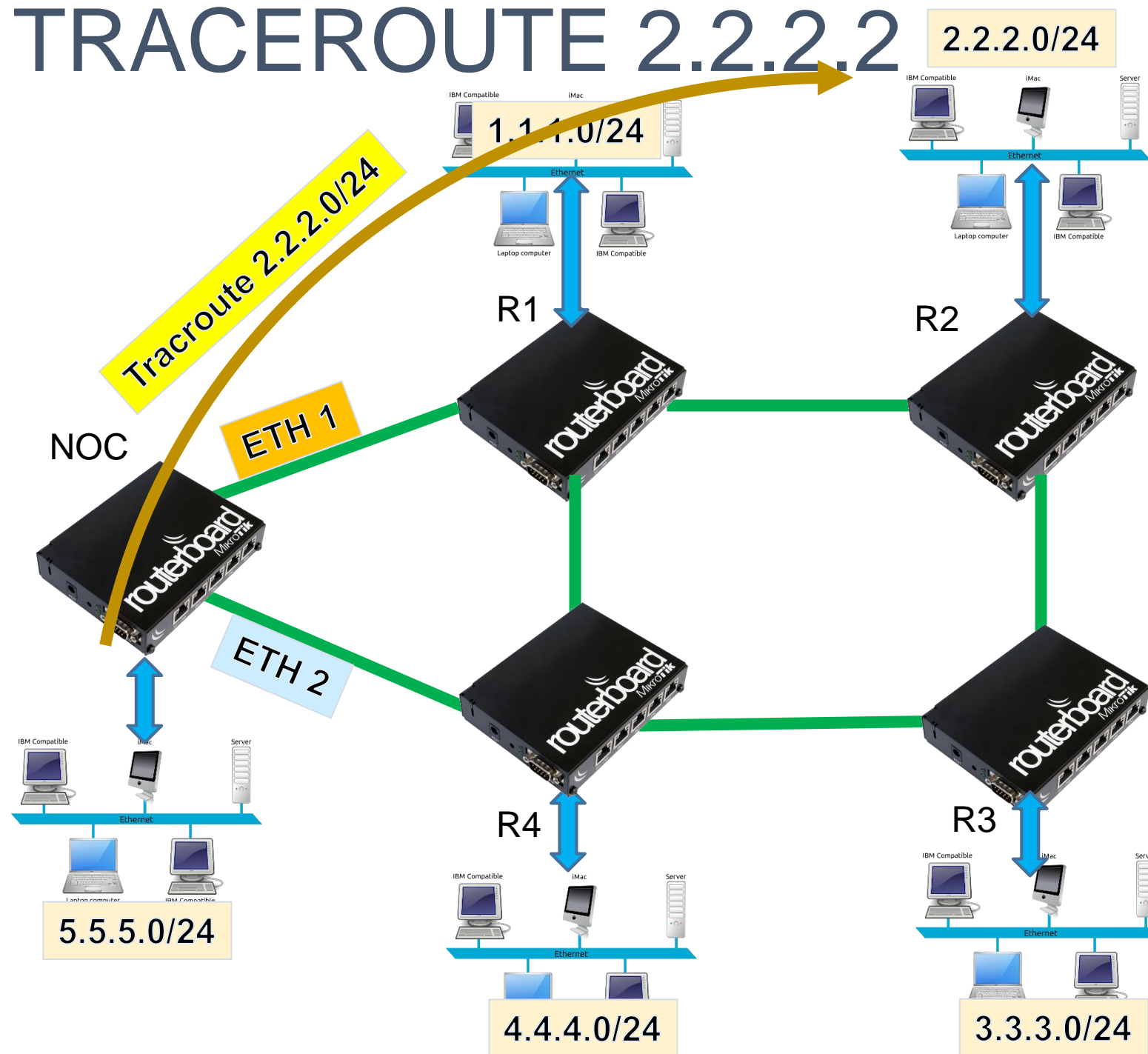
Main
Backup

Route List		
Routes	Nexthops	Rules
+ - ✓ ✕ [icon] [icon]		
	Dst. Address /	Gateway
Db	▶ 1.1.1.0/24	10.4.0.1 reachable ether2
DAb	▶ 1.1.1.0/24	10.5.0.2 reachable ether1
DAb	▶ 2.2.2.0/24	10.5.0.2 reachable ether1
Db	▶ 2.2.2.0/24	10.4.0.1 reachable ether2
DAb	▶ 3.3.3.0/24	10.4.0.1 reachable ether2
Db	▶ 3.3.3.0/24	10.5.0.2 reachable ether1
Db	▶ 4.4.4.0/24	10.4.0.1 reachable ether2
DAb	▶ 4.4.4.0/24	10.5.0.2 reachable ether1
DAC	▶ 5.5.5.0/24	ether3 reachable

NOC

Main
Backup
Main
Backup

TEST TRACEROUTE 2.2.2.2



2.2.2 via ether1, Cara ubah via ether2 ?

Route List

Routes Nexthops Rules VRF

+ - ✓ ✗ 📄 🔍

	Dst. Address	Gateway
Db	1.1.1.0/24	10.4.0.1 reachable ether2
DAb	1.1.1.0/24	10.5.0.2 reachable ether1
DAb	2.2.2.0/24	10.5.0.2 reachable ether1
Db	2.2.2.0/24	10.4.0.1 reachable ether2
DAb	3.3.3.0/24	10.4.0.1 reachable ether2
Db	3.3.3.0/24	10.5.0.2 reachable ether1
Db	4.4.4.0/24	10.4.0.1 reachable ether2
DAb	4.4.4.0/24	10.5.0.2 reachable ether1
DAC	5.5.5.0/24	ether3 reachable

NOC

Main

Backup

Interface List

Interface Interface List Ethernet EoIP Tunnel IP Tunnel GRE Tunnel VLAN VRRP Bonding LTE

+ - ✓ ✗ 📄 🔍

	Name	Type	Actual MTU	L2 MTU	Tx	Rx	Tx Pack
R	LAN	Bridge	1500	65535	0 bps	0 bps	
R	LO	Bridge	1500	65535	0 bps	0 bps	
R	ether1	Ethernet	1500	1598	54.7 Mbps	54.1 Mbps	
R	ether2	Ethernet	1500	1598	0 bps	0 bps	

TEST TRACEROUTE 2.2.2.2

2.2.2.0/24

1.1.1.0/24

2.2.2.0/24

NOC

ETH 1

ETH 2

R1

R2

R4

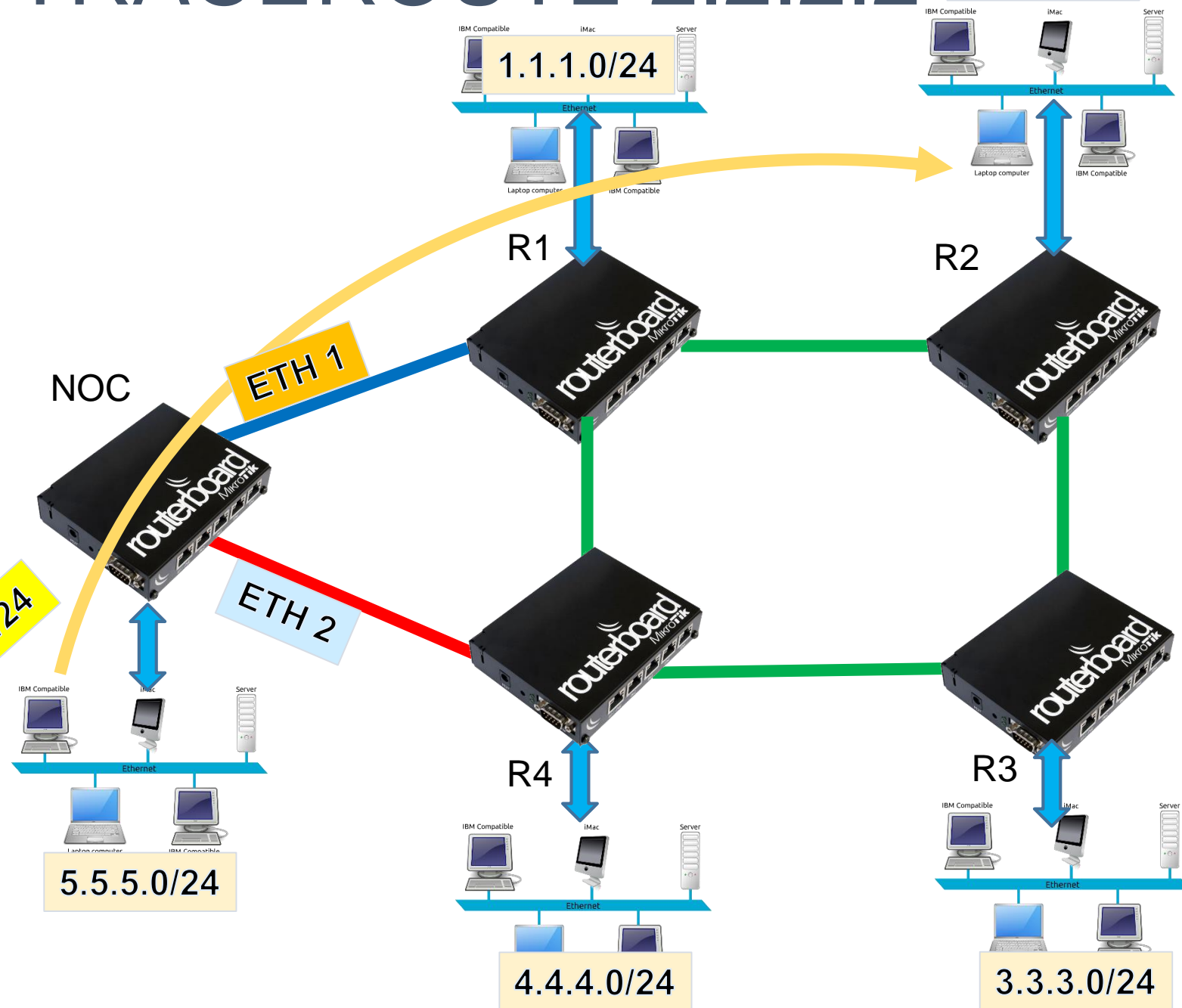
R3

5.5.5.0/24

4.4.4.0/24

3.3.3.0/24

Tracroute 2.2.2.0/24



Urutan Prioritas iBGP Parameter

- Next-hop validation
- Highest WEIGHT (default 0)
- **Highest LOCAL-PREF (default 100) ← OUT TRAFFIC**
- Locally originated path (aggregate, BGP network)
- Lowest origin type (IGP,EGP,Incomplete)
- **Lowest MED (default 0) ← IN TRAFFIC**
- Prefer eBGP over iBGP
- Prefer the route with lowest router ID or ORIGINATOR_ID
- Shortest route reflection cluster (default 0)
- Prefer the path that comes from the lowest neighbor address

ROUTE FILTER

Route Filter <2.2.2.0/24>

Matchers BGP Actions BGP Actions

Chain:

Prefix: ☐

Route Filter <2.2.2.0/24>

Matchers BGP Actions BGP Actions

Set BGP Weight:

Set BGP Local Pref.:

NOC

BGP Peer <R1>

General Advanced Status

Name:

Instance:

Remote Address:

Remote Port:

Remote AS:

TCP MD5 Key:

Nexthop Choice:

☐ Multihop

☐ Route Reflect

Hold Time:

Keepalive Time:

TTL:

Max Prefix Limit:

Max Prefix Restart Time:

In Filter:

Out Filter:

AllowAS In:

TRACEROUTE 2.2.2.2

Route List

Routes

Nexthops

Rules

VRF

	Dst. Address	Gateway	Distance	BGP Local Pref.	
Db	1.1.1.0/24	10.4.0.1 reachable ether2	20		
DAb	1.1.1.0/24	10.5.0.2 reachable ether1	20		
Db	2.2.2.0/24	10.5.0.2 reachable ether1	20	50	
DAb	2.2.2.0/24	10.4.0.1 reachable ether2	20		
Db	3.3.3.0/24	10.4.0.1 reachable ether2	20		
DAb	3.3.3.0/24	10.5.0.2 reachable ether1	20		
Db	4.4.4.0/24	10.4.0.1 reachable ether2	20		
DAb	4.4.4.0/24	10.5.0.2 reachable ether1	20		
DAC	5.5.5.0/24	ether3 reachable	0		

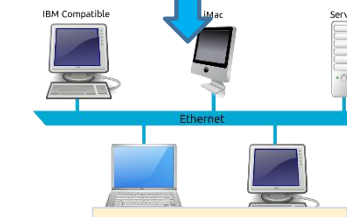
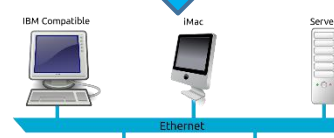
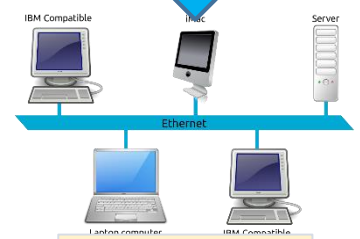
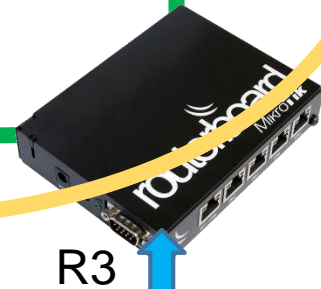
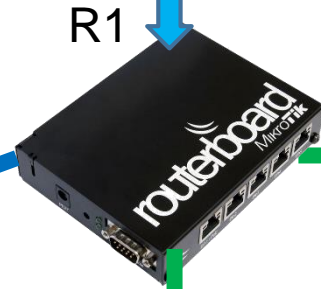
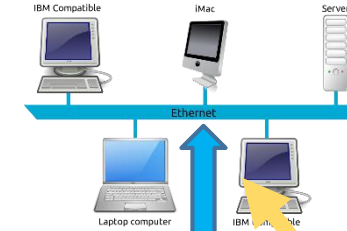
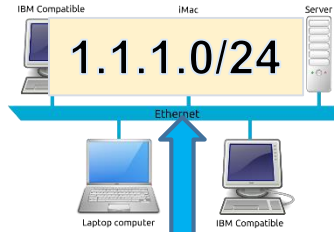
NOC

Interface List

Interface	Interface List	Ethernet	EoIP Tunnel	IP Tunnel	GRE Tunnel	VLAN	VRRP	Bonding	LTE
<div><div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div><div><div></div><div></div></div></div></div>									
	Name	Type	Actual MTU	L2 MTU	Tx	Rx			
R	LAN	Bridge	1500	65535	0 bps	0 bps			
R	LO	Bridge	1500	65535	0 bps	0 bps			
R	ether1	Ethernet	1500	1598	0 bps	54.0 Mbps			
R	ether2	Ethernet	1500	1598	54.0 Mbps	816 bps			

TEST TRACEROUTE 2.2.2.2

2.2.2.0/24



Tracroute 2.2.2.0/24

UBAH RX 2.2.2.2 via ETHER 2

Route Filter <>

Matchers BGP Actions BGP Actions

Chain: R1-OUT

Prefix:

Route Filter <>

Matchers BGP Actions BGP Actions

Set BGP Weight:

Set BGP Local Pref.:

Set BGP Prepend:

Set BGP Prepend Path:

Set BGP MED: 5

BGP Peer <R1>

General Advanced Status

Name: R1

Instance: default

Remote Address: 10.5.0.2

Remote Port:

Remote AS: 65530

TCP MD5 Key:

Nexthop Choice: default

☐ Multihop

☐ Route Reflect

Hold Time: 180

Keepalive Time:

TTL: default

Max Prefix Limit:

Max Prefix Restart Time:

In Filter: R1-IN

Out Filter: R1-OUT

TRACEROUTE 2.2.2.2

Route List			
Routes	Nexthops	Rules	VRF
<div><div>+</div><div>-</div><div>✓</div><div>✗</div><div>📄</div><div>🔍</div></div>			
	Dst. Address /	Gateway /	BGP MED
DAb	▶ 1.1.1.0/24	10.10.10.1 recursive via 10.1.0.1 ether2	
DAC	▶ 2.2.2.0/24	LAN reachable	
DAb	▶ 3.3.3.0/24	10.10.10.3 recursive via 10.2.0.2 ether1	
DAb	▶ 4.4.4.0/24	10.10.10.4 recursive via 10.2.0.2 ether1	
Db	▶ 5.5.5.0/24	10.10.10.1 recursive via 10.1.0.1 ether2	5
DAb	▶ 5.5.5.0/24	10.10.10.4 recursive via 10.2.0.2 ether1	

R2

Interface List

Interface

Interface List

Ethernet

EoIP Tunnel

IP Tunnel

GRE Tunnel

VLAN

VRRP

Bonding

LTE

+

-

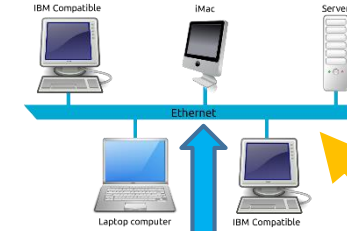
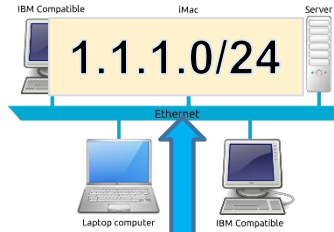
✓

✗

	Name	Type	Actual MTU	L2 MTU	Tx	Rx
R	LAN	Bridge	1500	65535	0 bps	0 bps
R	LO	Bridge	1500	65535	0 bps	0 bps
R	ether1	Ethernet	1500	1598	0 bps	0 bps
R	ether2	Ethernet	1500	1598	53.3 Mbps	53.5 Mbps

TEST TRACEROUTE 2.2.2.2

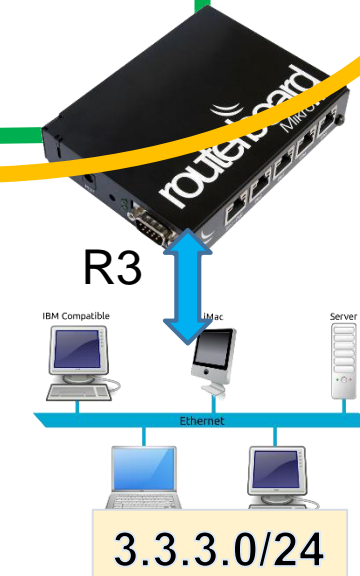
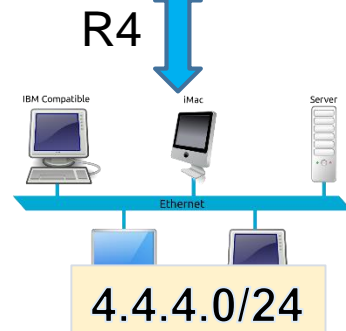
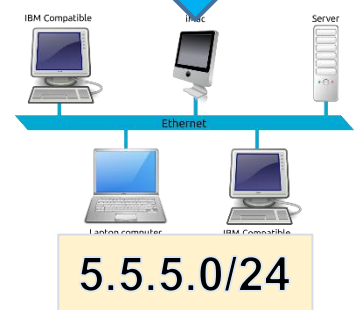
2.2.2.0/24



ETH 1

ETH 2

Tracroute 2.2.2.0/24





THANK YOU

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