MUM Poland
February 28-29, 2008

Bridge Over Routed Network

Presented at:

Mikrotik User Meeting, Krakow, 2008

By:

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Introduction

- Name: Valens Riyadi
- Country: Indonesia
  - Graduated as Architect 1998
  - Work at Citraweb (Citranet)
    - ISP, Web Developer, Mikrotik Reseller
  - Photographer
    - Administrator of www.fotografer.net
  - Head of Security Dept, Indonesian ISP Association
  - Volunteer for Airputih Foundation, IT Emergency Task Force
  - Steering Committee for ID-SIRTII
    Indonesia Security Incident Response Team on Information Infrastructure
  - Mikrotik Certified Consultant & Trainner

My Company

- Citraweb Nusa Infomedia
  - Web Developer (since 2000)
  - Small ISP (since 2001)
  - Mikrotik Reseller (since 2002)
- Located at : Yogyakarta Indonesia
- Using RouterOS since 2.3.15

Yogyakarta City

- 3,4 million of population
  - Tourism City
  - Student City
    - Almost 50% of population are students from other cities.
  - Finally ……. Cyber café City

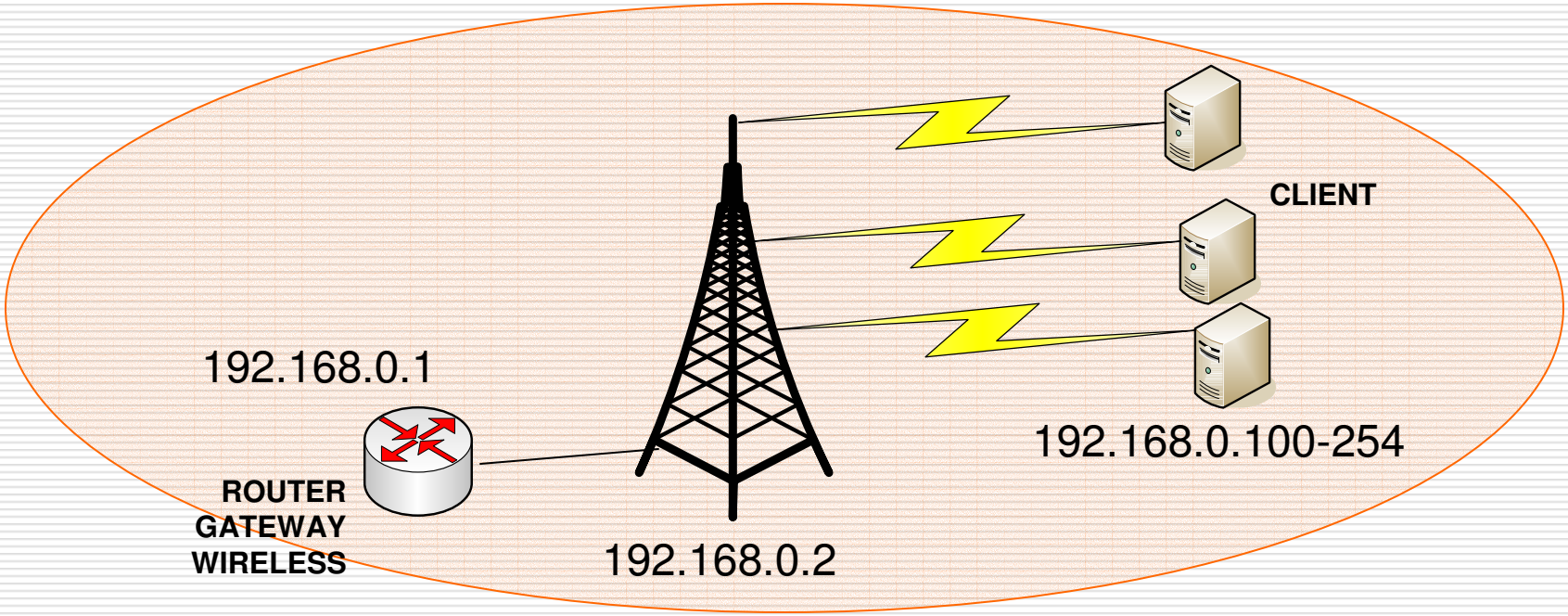


In the begining

- When someone starts his (wireless) network, probably 99% he will choose bridge network then routed network.
  - Yes, bridge is easier then routing
  - Most of wireless equipments in the low end market doesn’t support full routing protocol

Simple Bridge Network

- Using IP in the same subnet
- Using same gateway

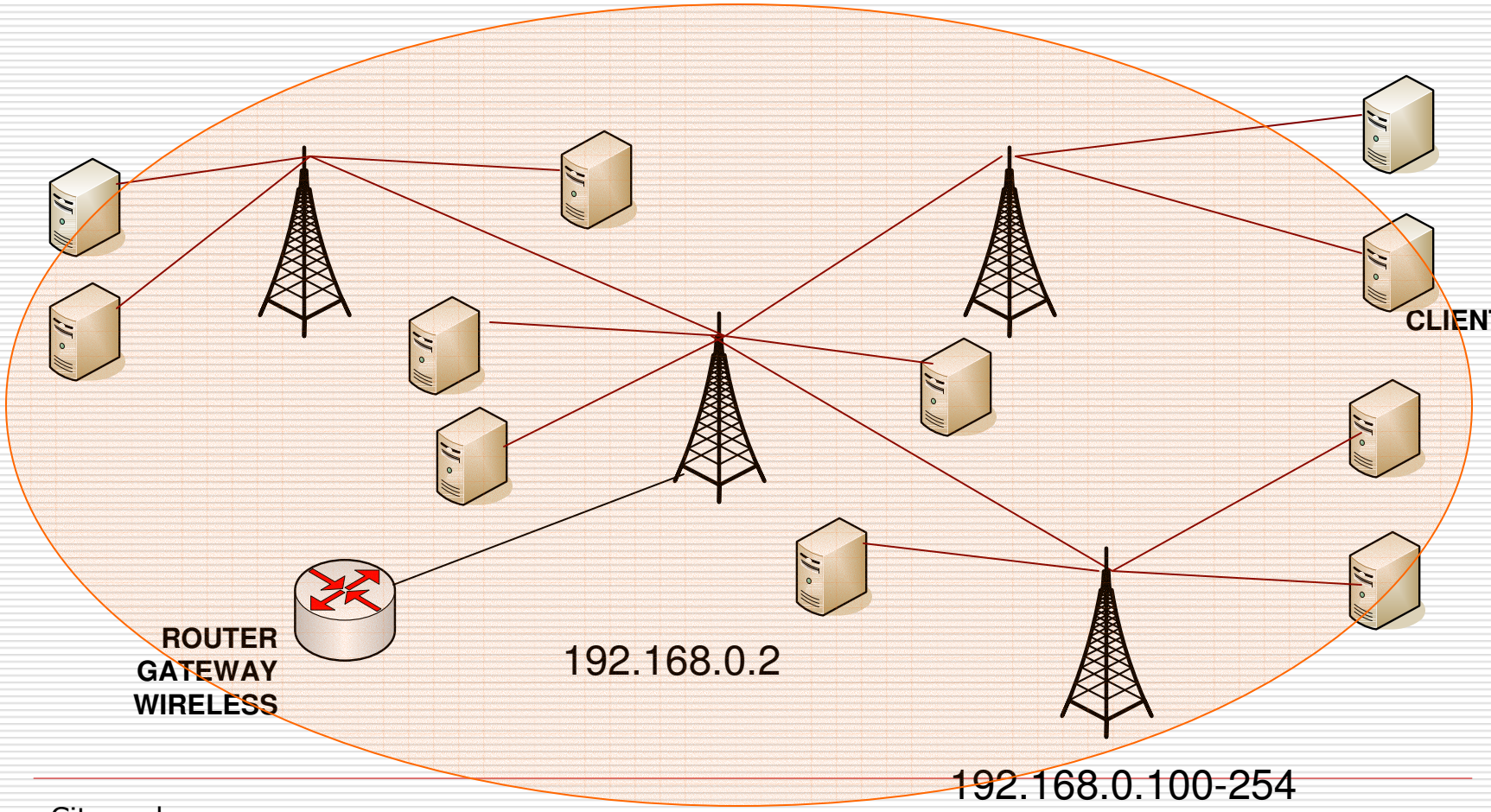


- the network grows.....

Wireless Installation

a lot of clients….
need more APs….
more repeaters
and base stations

Complex Bridge Network



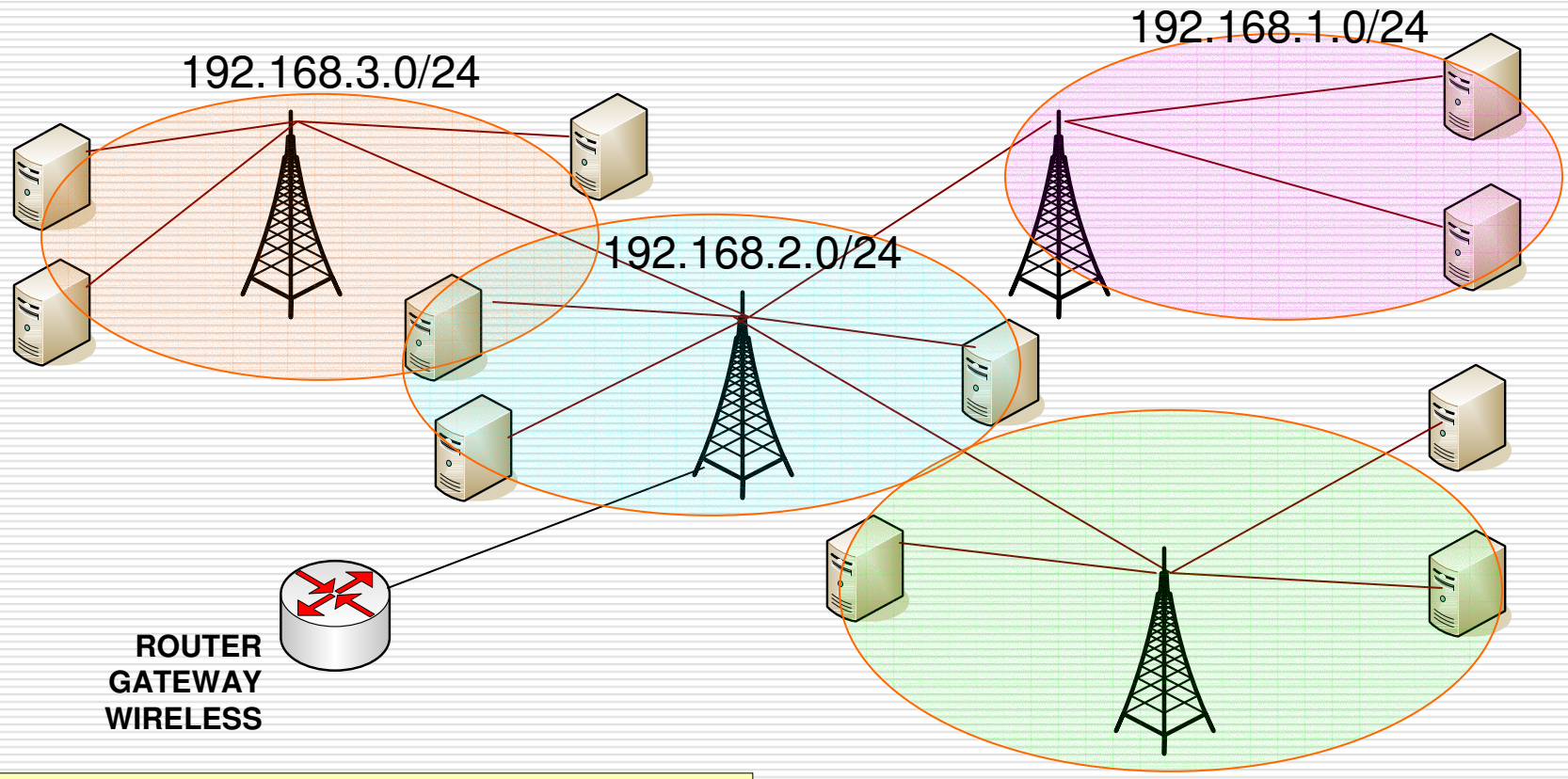
Imagine Later .....

- When one client has virus…. it will affect whole subnet (network)
- Sometimes… bridge loop happens
- It’s complicated to make a failover and load balance network across many base station and repeater

How about using routed network?

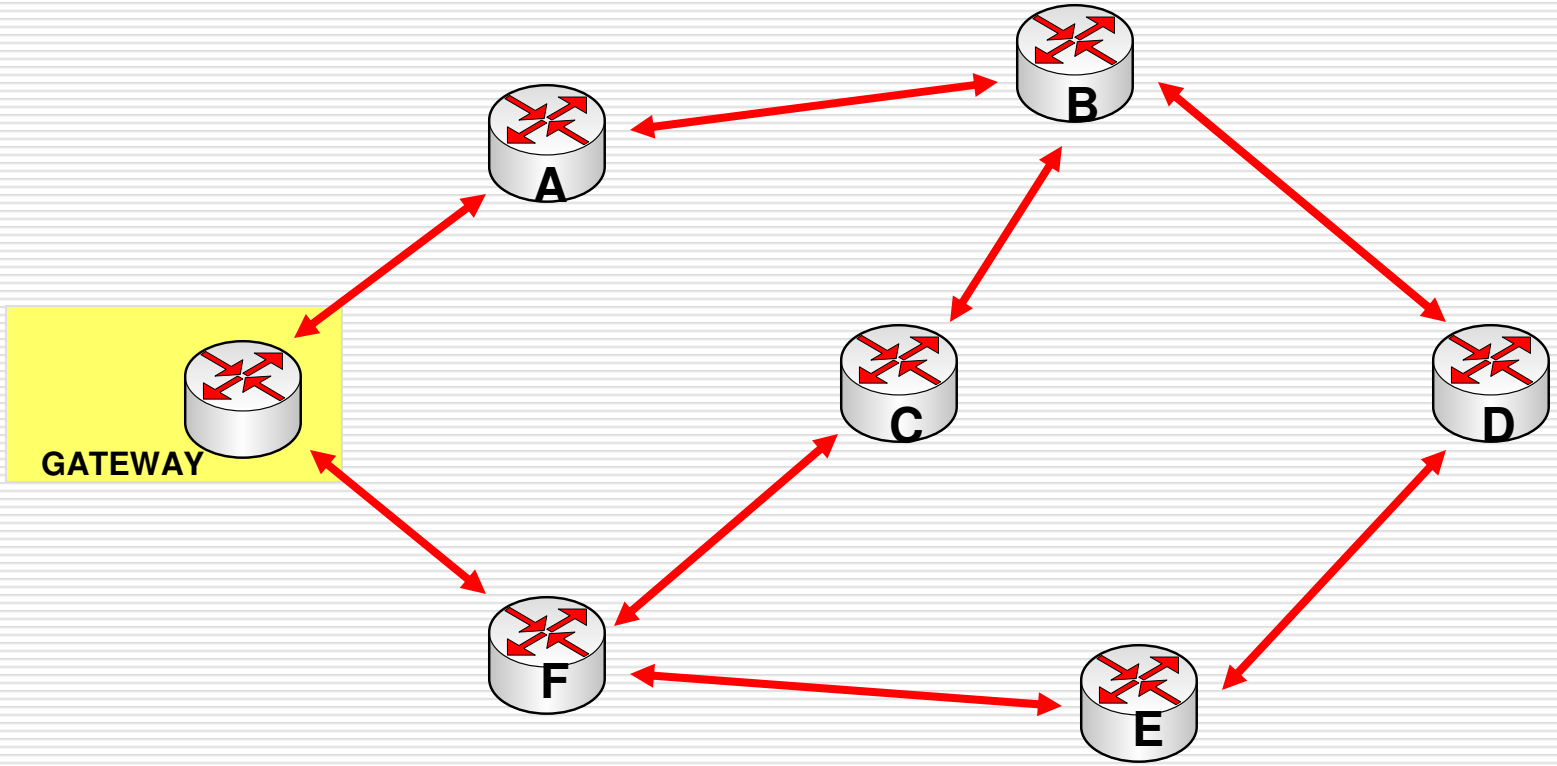
- Then… start thinking about migration to routed network

Routed Network



every network segment have different ip address subnet.

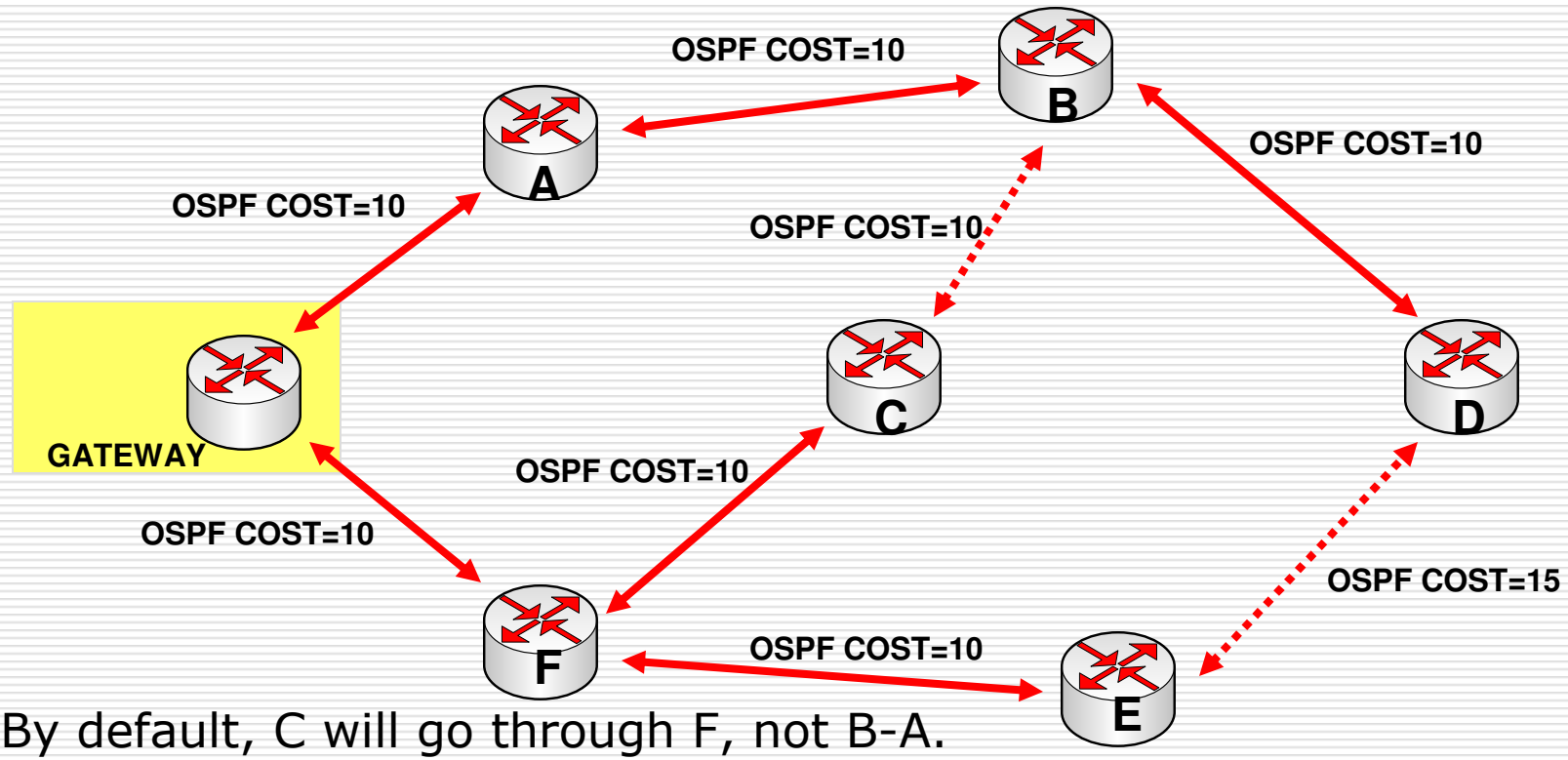
Network Simulation



Dynamic Routing

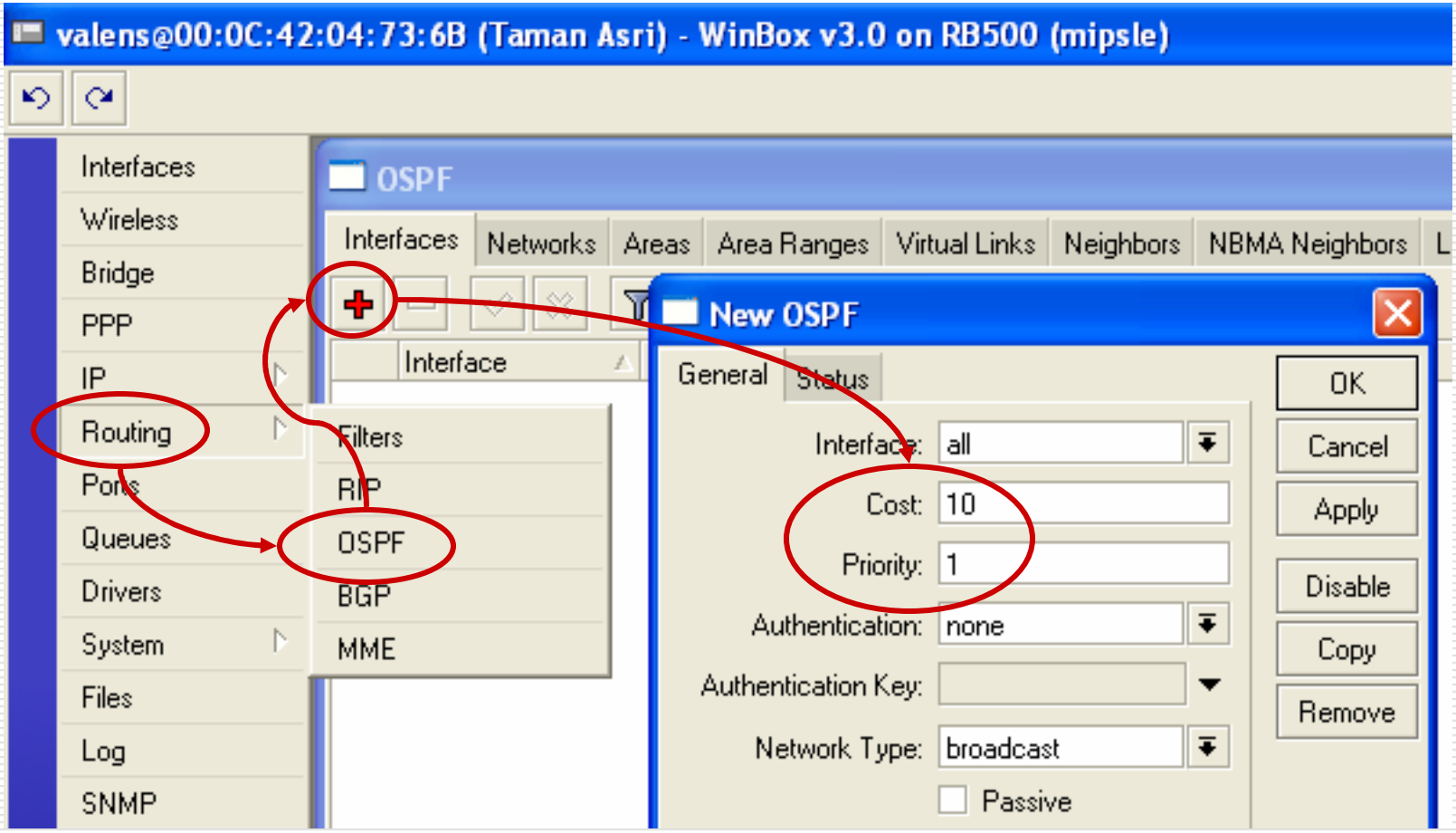
- More clients ….. more routing rules
- We can use OSPF to automate routing distribution to all routers in the network.
- Use OSPF priority and cost to arrange how load balance and fail over will affect your network

OSPF Cost Setting

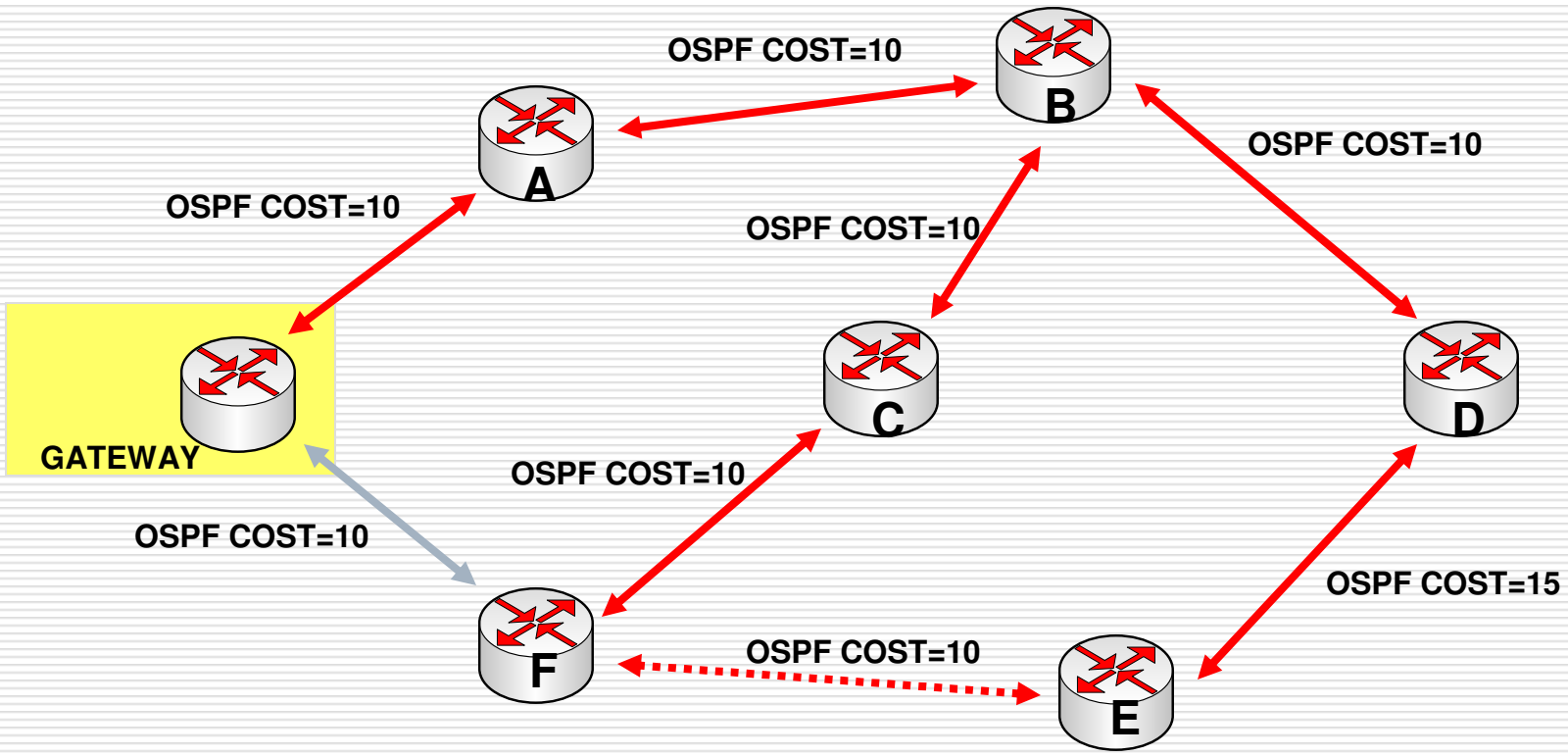


By default, C will go through F, not B-A.
For D, we have to adjust cost setting on link E-D so D will go through B-A, not E-F.

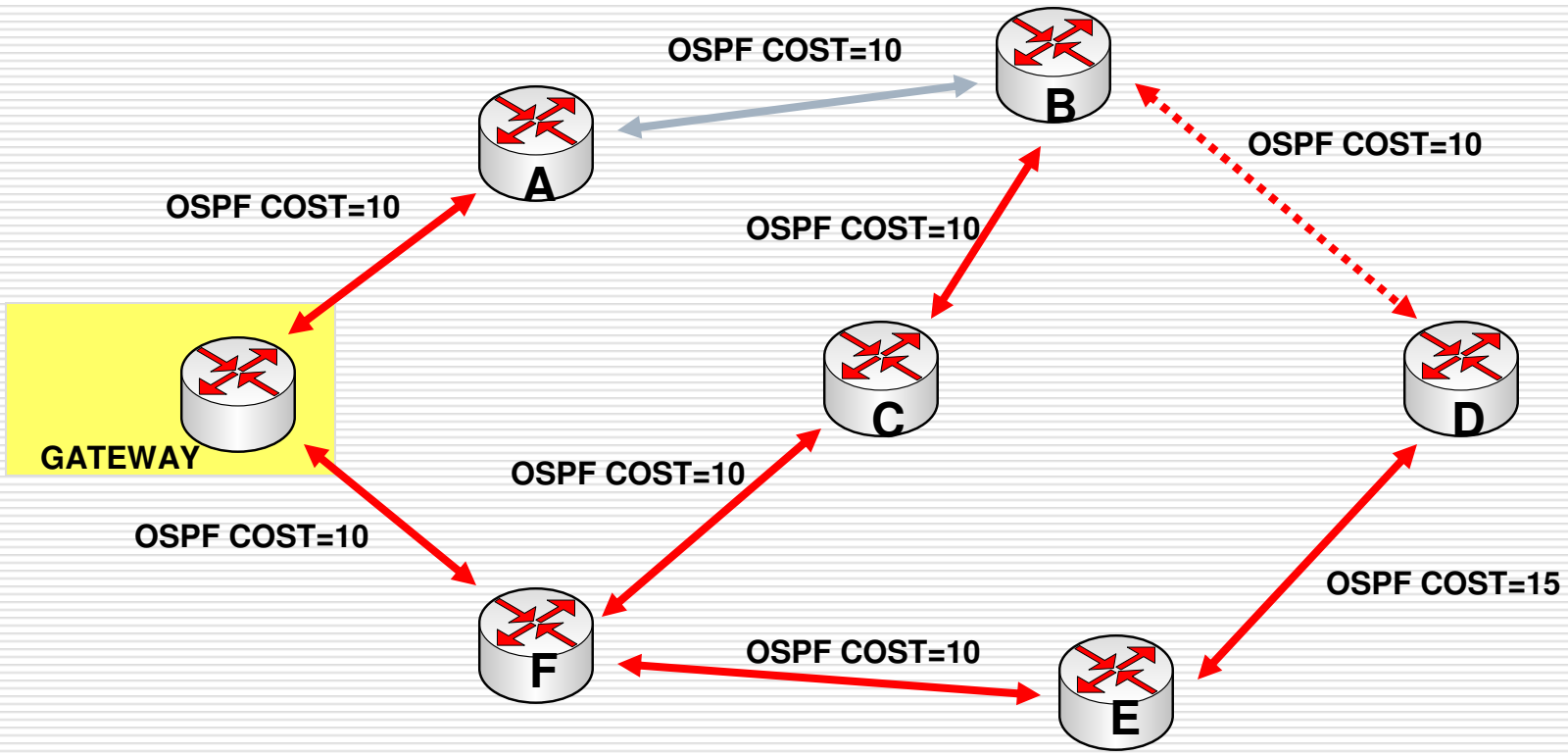
OSPF on Winbox



Fail Over (1)


PRIMARY LINK
BACKUP LINK
OSPF COST=10
OSPF COST=10
OSPF COST=10
OSPF COST=10
OSPF COST=10
OSPF COST=10
OSPF COST=10
OSPF COST=15
A
B
C
D
E
F
GATEWAY

Fail Over (2)


PRIMARY LINK
BACKUP LINK
OSPF COST=10
OSPF COST=10
OSPF COST=10
OSPF COST=10
OSPF COST=10
OSPF COST=10
OSPF COST=10
OSPF COST=15
A
B
C
D
E
F
GATEWAY

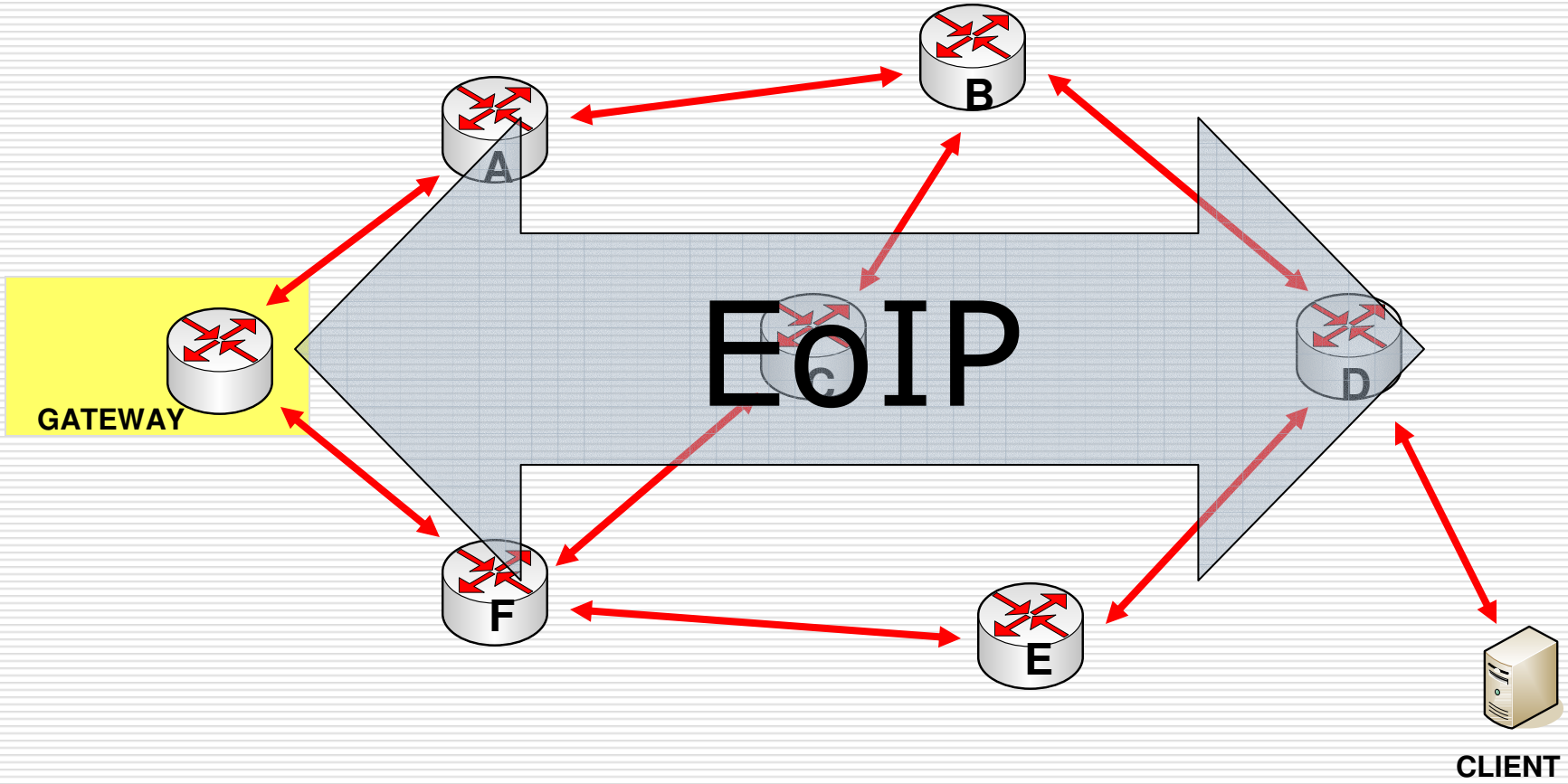
Oh….. still have problems

- As we have more base stations and repeaters, network hop from client to NOC will increase.
- Some clients don’t like network hop.
- Client will see route change when fail over work.

Back to bridge

- You can make bridge over routed network
- Client will not see :
  - hop in your network
  - hop differentiate cause by fail over
- You can utilize:
  - single PPPoE gateway right on the NOC
  - deliver hotspot gateway to several nodes in the network

Using EoIP



EoIP Setting

- At Gateway Router:
  - Make EoIP tunnel to Router D
  - Put IP Address Gateway at EoIP interface
- At Router D:
  - Make EoIP Tunnel to Gateway Router
  - Make bridge, and set EoIP interface and client interface as the bridge port

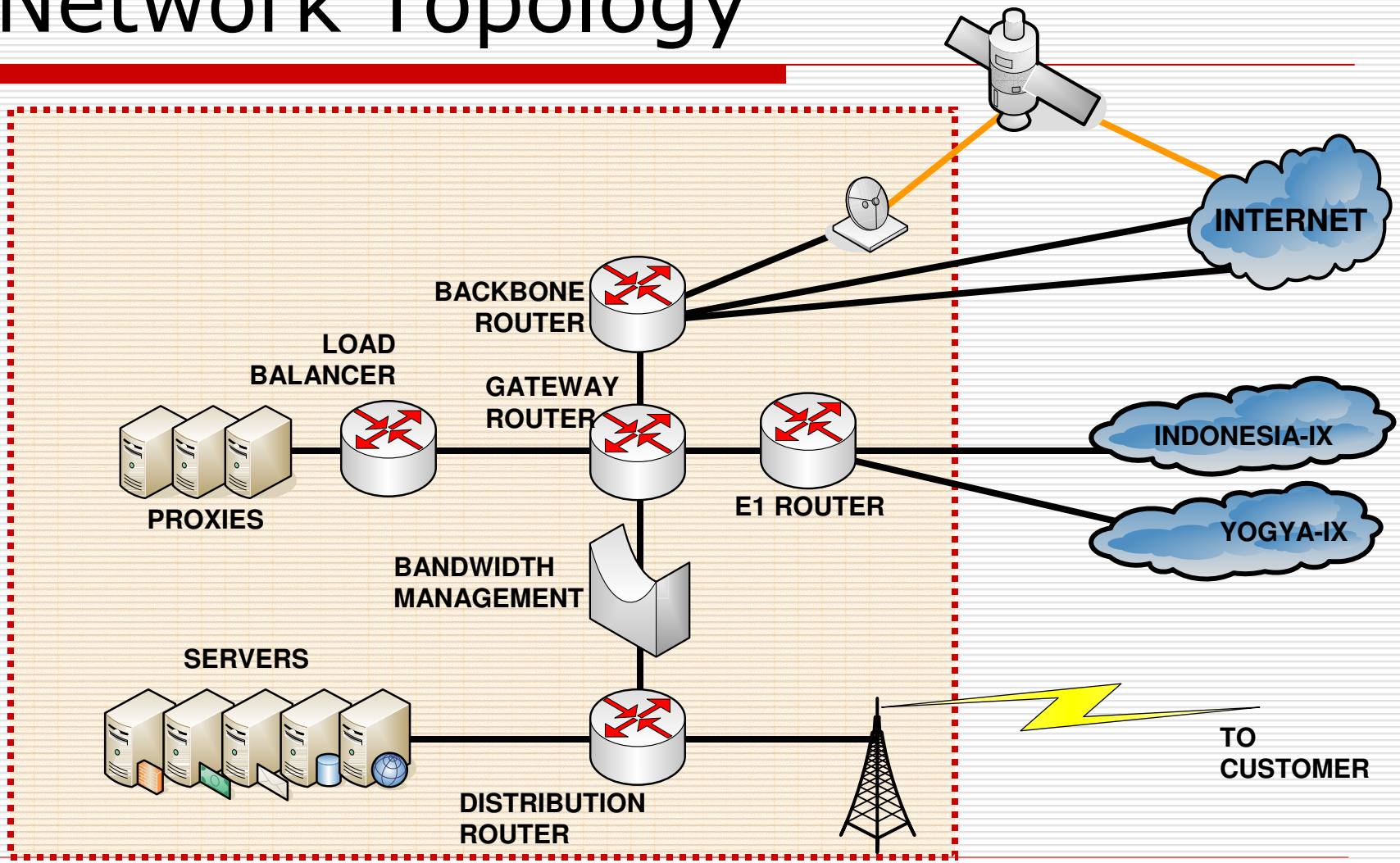
Case Study

Using several EoIPs over 1 bonding

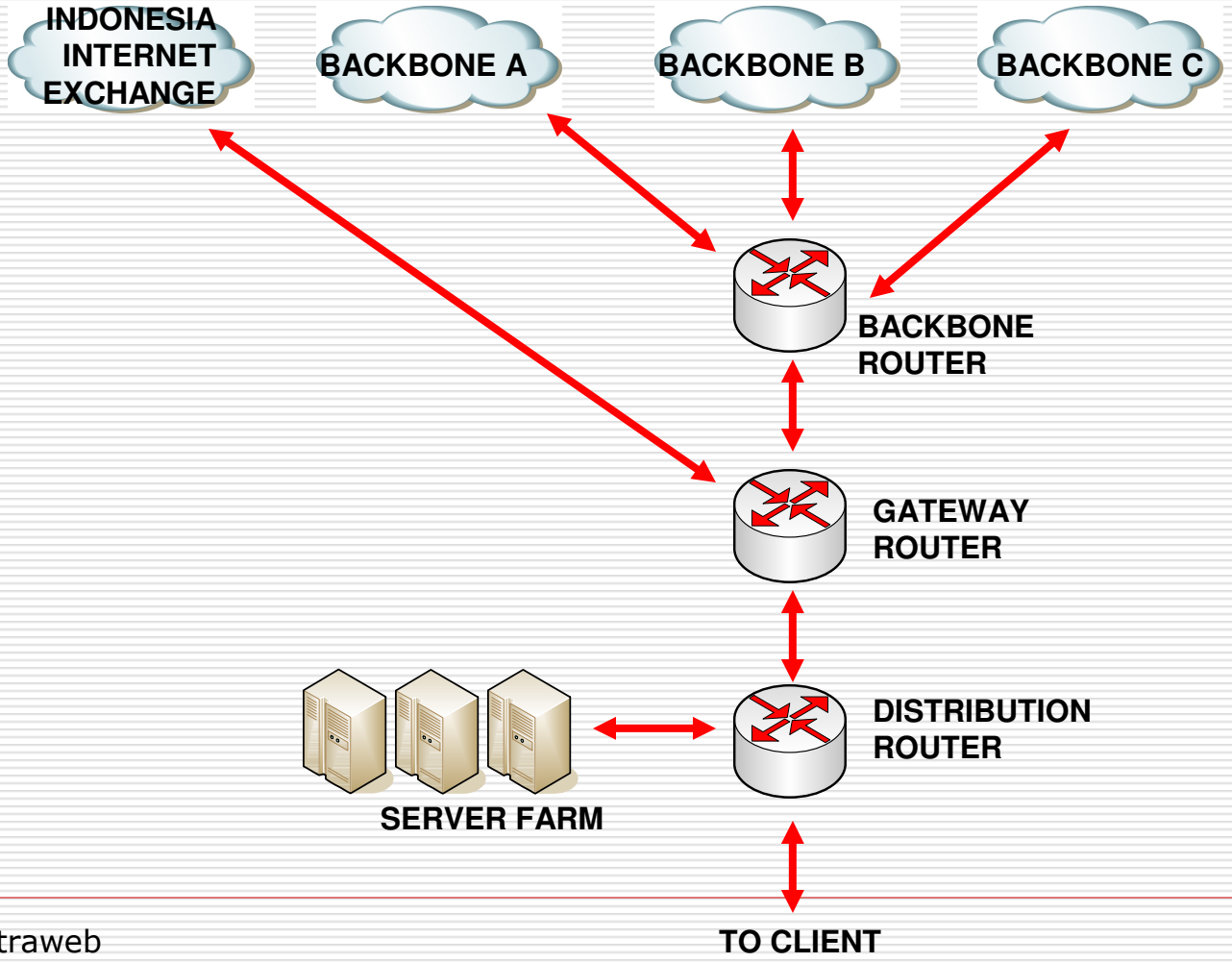
Case Study

- We are in the process to move our NOC to another location
- We have several microwave links and fiber connections from telco operators. It's difficult to manage they move all the links in time.
- We have 30 clients point directly to NOC, we can not move them all in the same time.

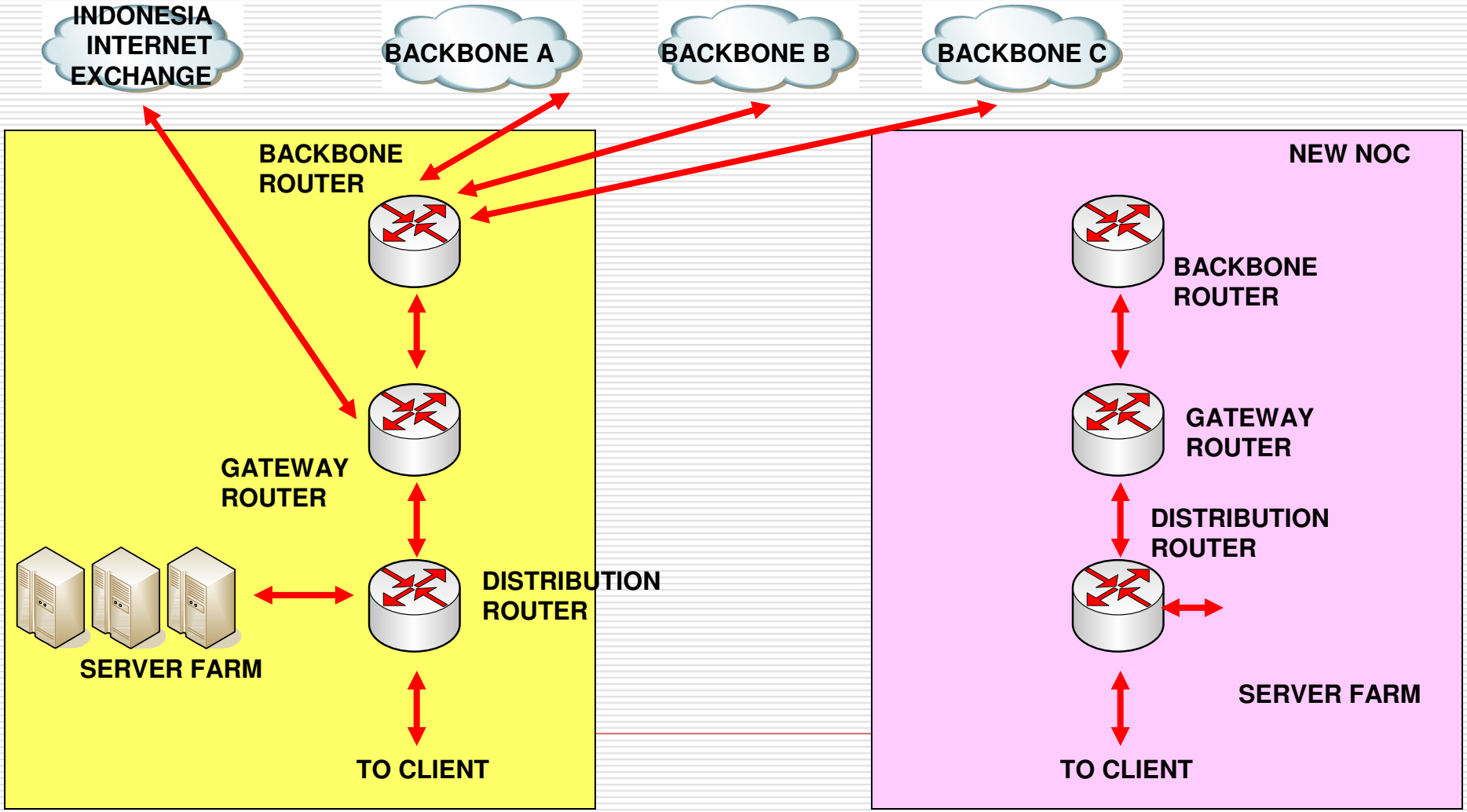
Network Topology



Configuration (Old NOC)



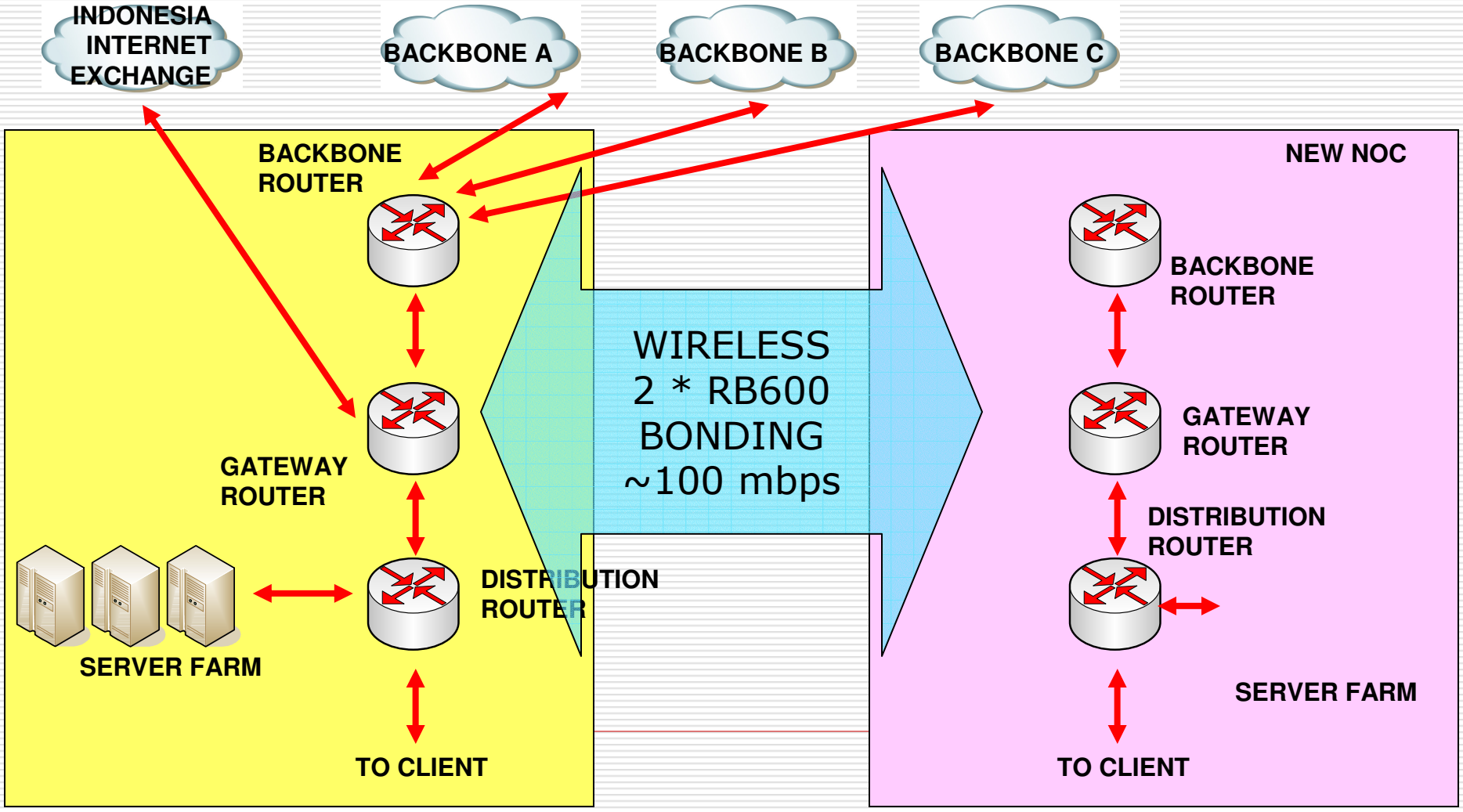
Migration Process



How we do it?

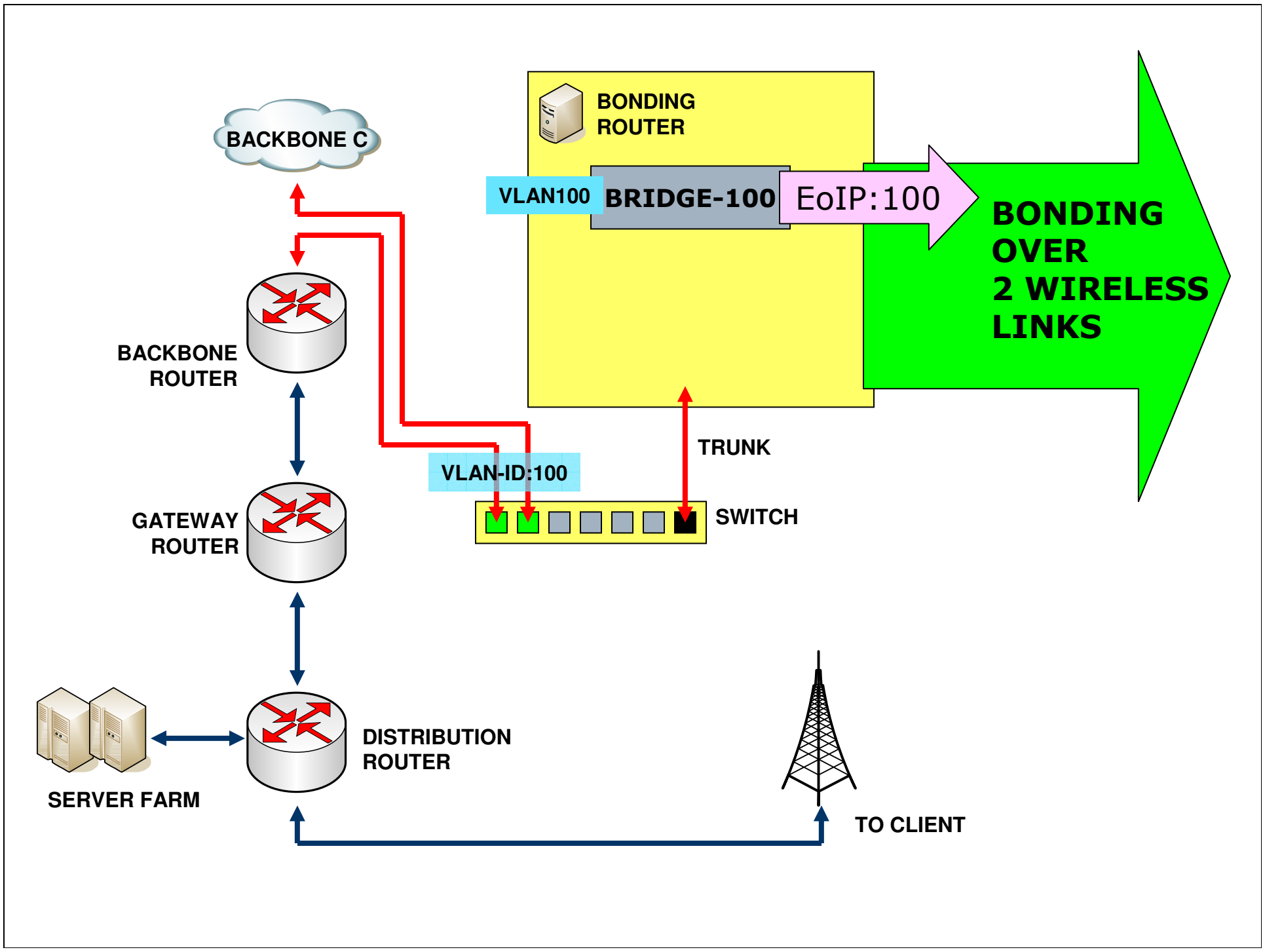
- Using **several EoIPs** over **one Bonding**
- We use it for temporary solution when we migrate our NOC to another location.

Migration Process

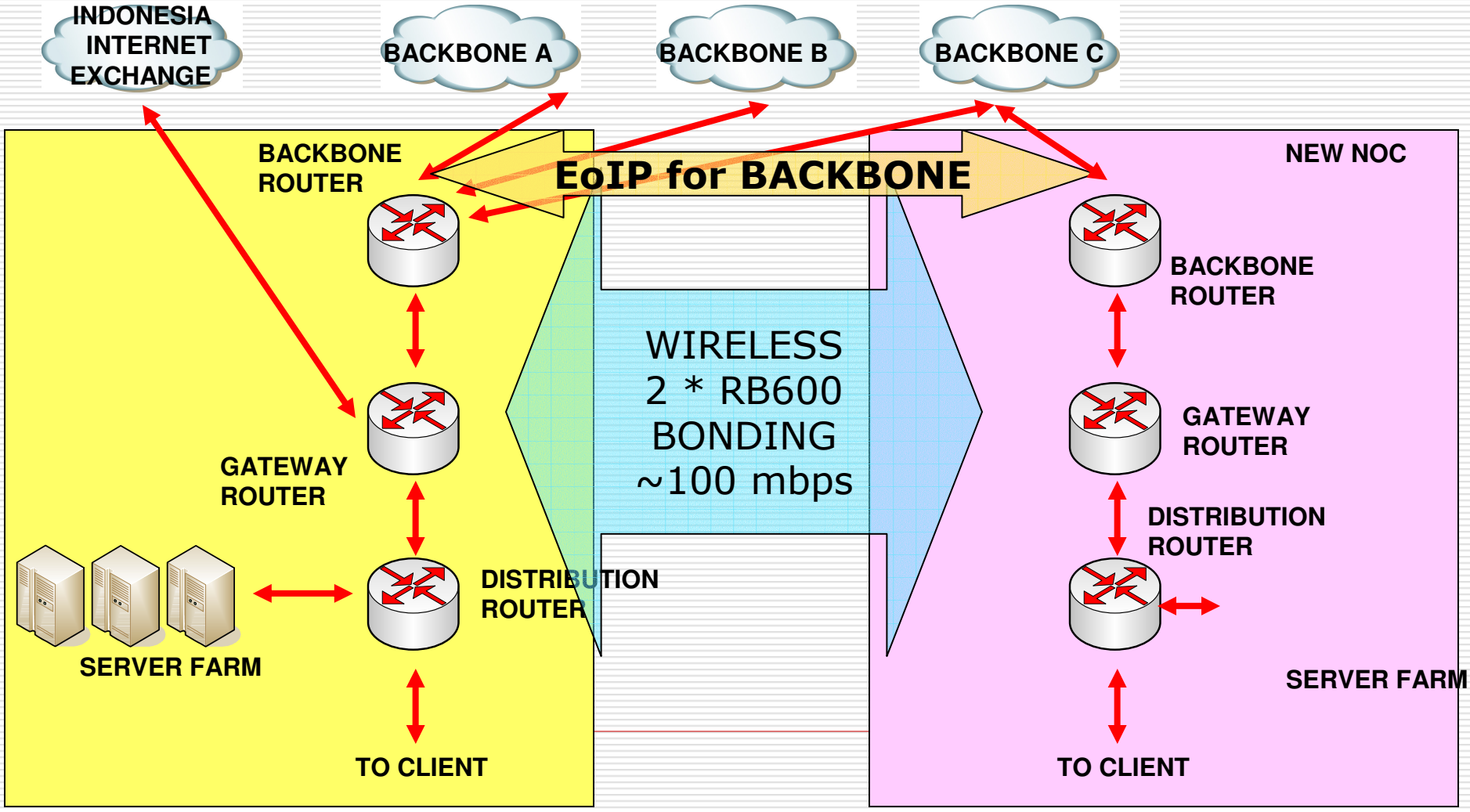


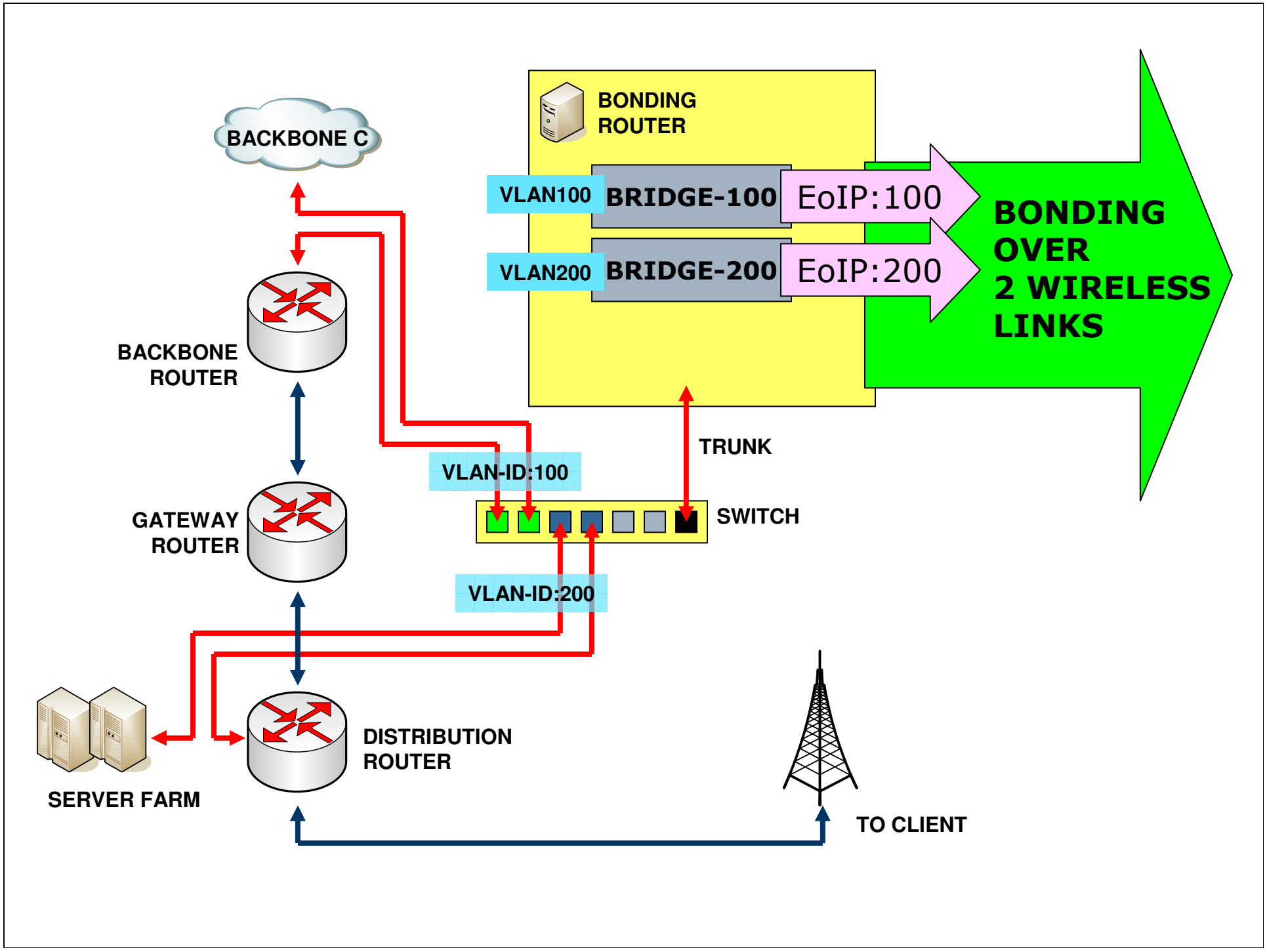
Wireless for Bonding

- Using 2 RB600 on each side

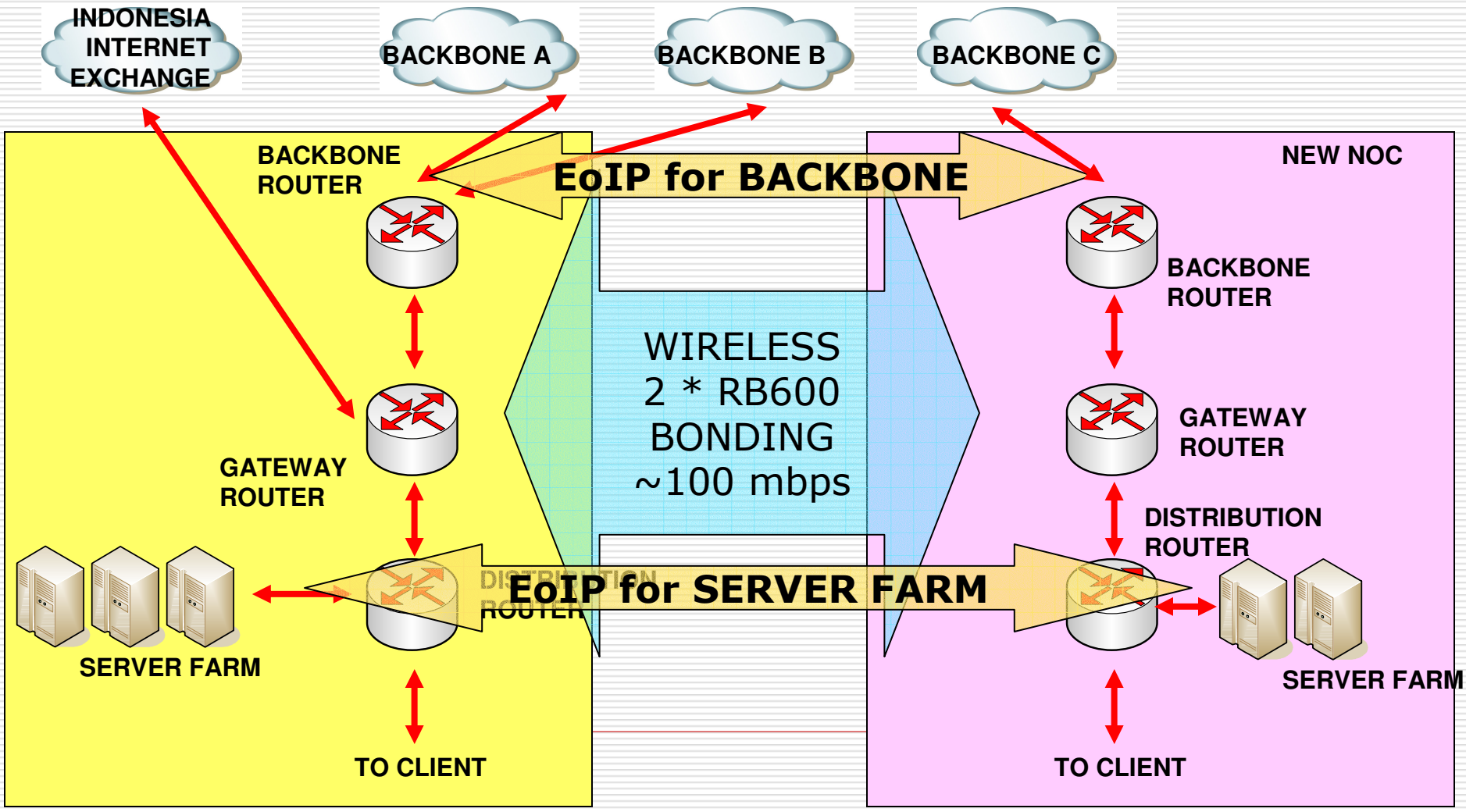

BACKBONE C
BONDING
ROUTER
VLAN100
BRIDGE-100
EoIP:100
BONDING
OVER
2 WIRELESS
LINKS
BACKBONE
ROUTER
GATEWAY
ROUTER
VLAN-ID:100
TRUNK
SWITCH
DISTRIBUTION
ROUTER
SERVER FARM
TO CLIENT

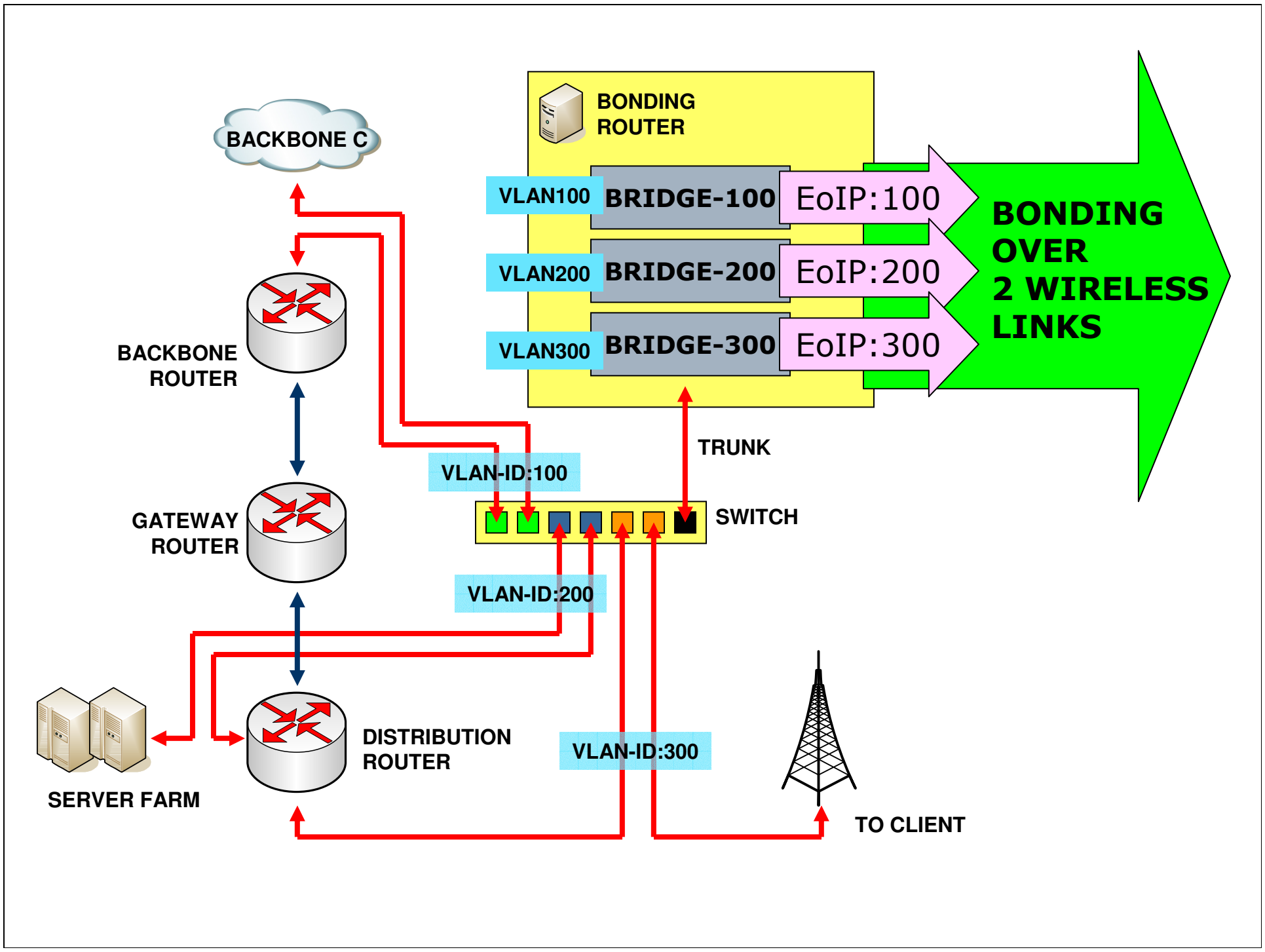
EoIP for Backbone



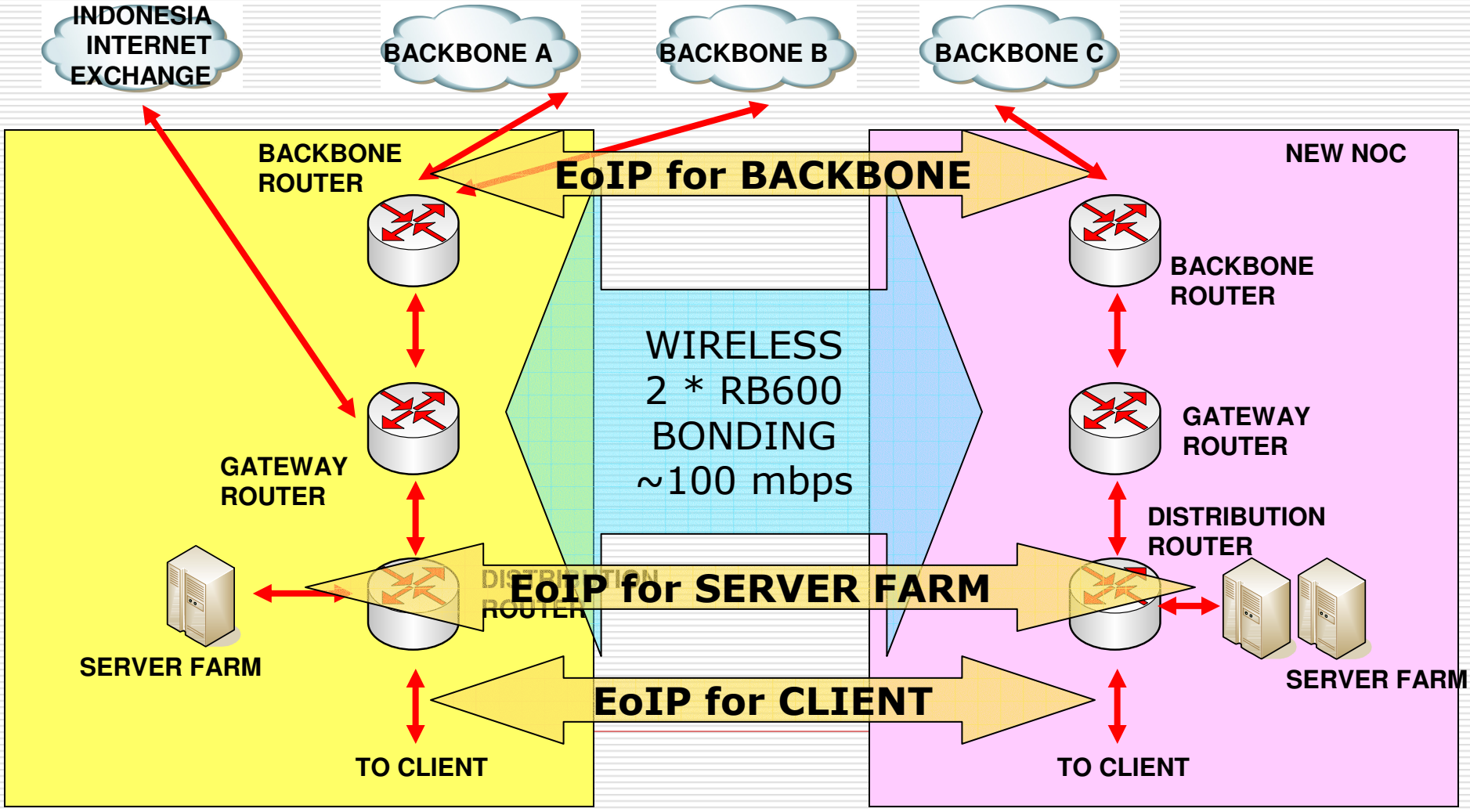

BACKBONE C
BONDING
ROUTER
VLAN100
BRIDGE-100
EoIP:100
VLAN200
BRIDGE-200
EoIP:200
BONDING
OVER
2 WIRELESS
LINKS
BACKBONE
ROUTER
GATEWAY
ROUTER
TRUNK
VLAN-ID:100
SWITCH
VLAN-ID:200
DISTRIBUTION
ROUTER
SERVER FARM
TO CLIENT

EoIP for Server

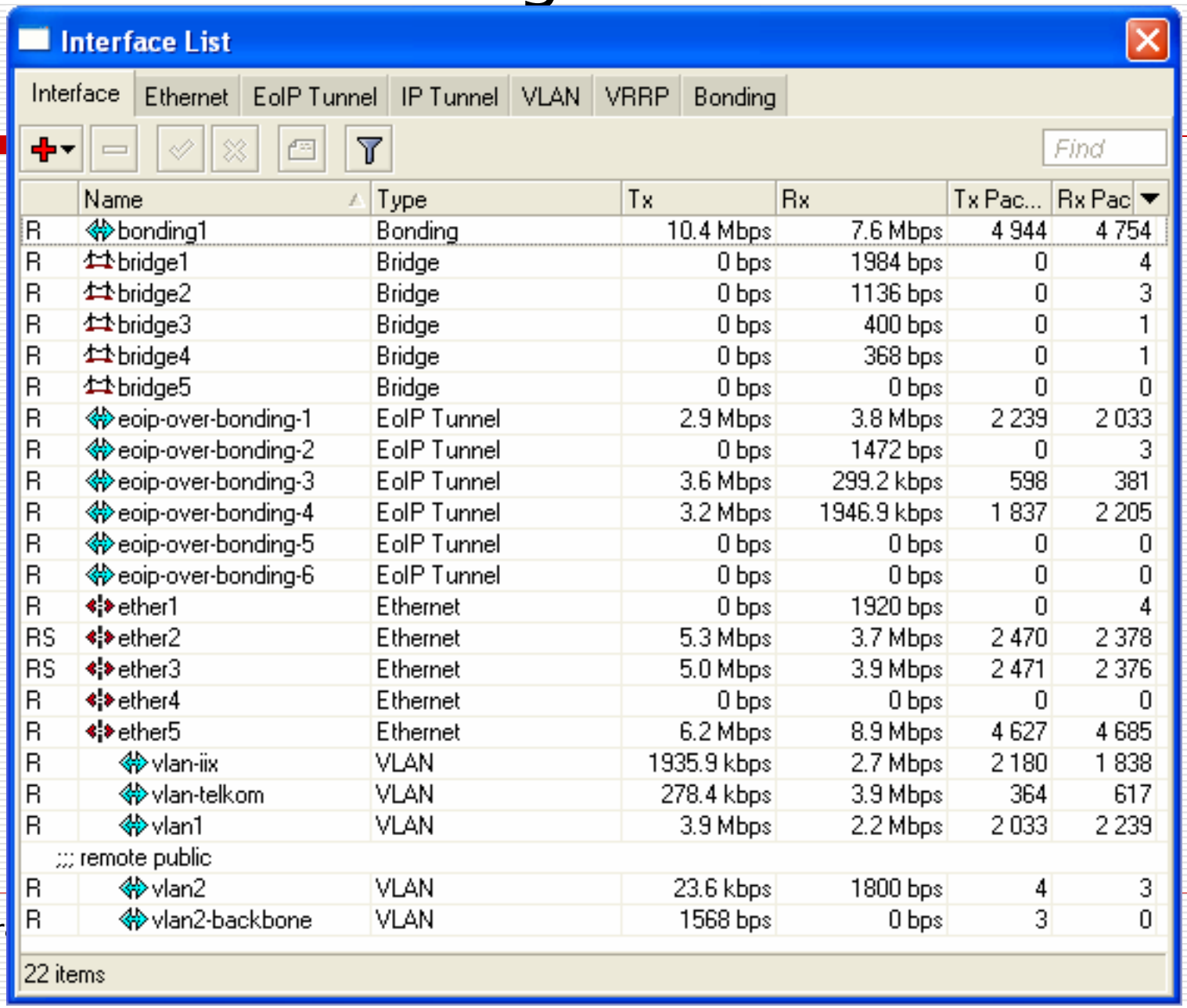



BACKBONE C
BONDING
ROUTER
VLAN100
BRIDGE-100
EoIP:100
VLAN200
BRIDGE-200
EoIP:200
VLAN300
BRIDGE-300
EoIP:300
BONDING
OVER
2 WIRELESS
LINKS
BACKBONE
ROUTER
TRUNK
VLAN-ID:100
GATEWAY
ROUTER
SWITCH
VLAN-ID:200
DISTRIBUTION
ROUTER
VLAN-ID:300
SERVER FARM
TO CLIENT

EoIP Over Bonding



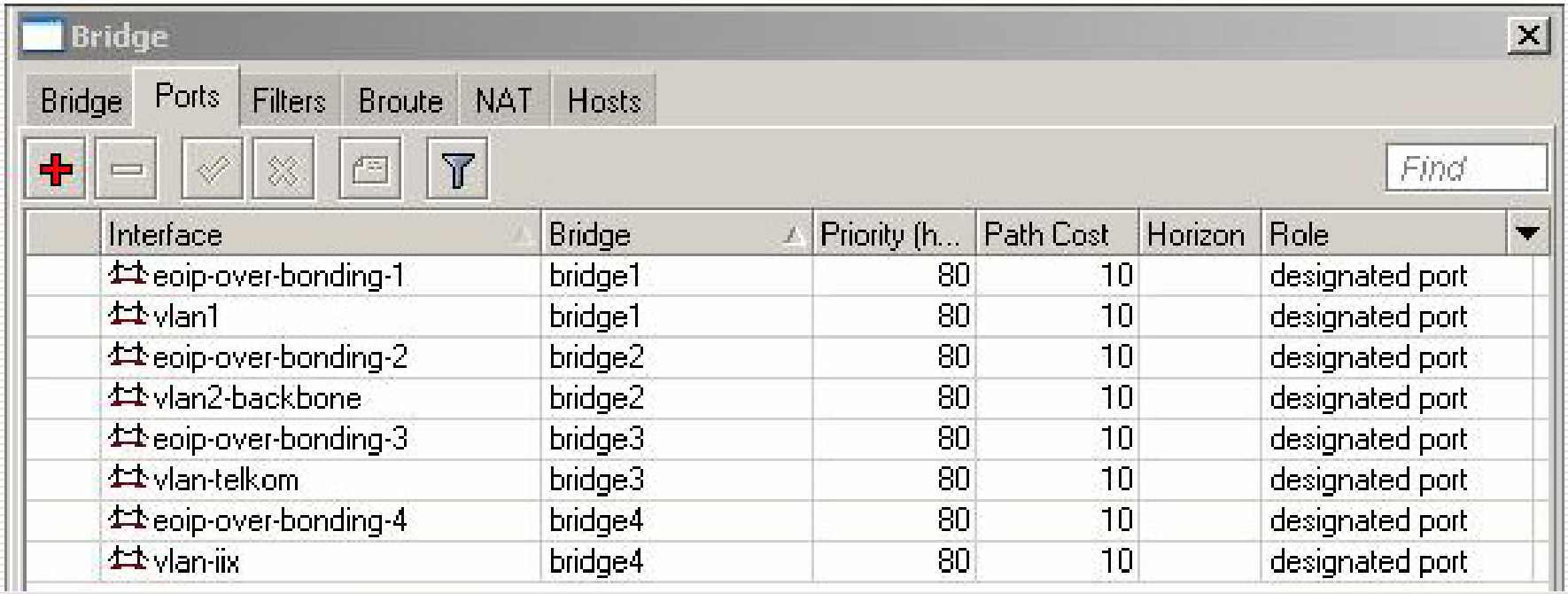
Interface Setting



	Name	Type	Tx	Rx	Tx Pac...	Rx Pac
R	bonding1	Bonding	10.4 Mbps	7.6 Mbps	4 944	4 754
R	bridge1	Bridge	0 bps	1984 bps	0	4
R	bridge2	Bridge	0 bps	1136 bps	0	3
R	bridge3	Bridge	0 bps	400 bps	0	1
R	bridge4	Bridge	0 bps	368 bps	0	1
R	bridge5	Bridge	0 bps	0 bps	0	0
R	eoip-over-bonding-1	EoIP Tunnel	2.9 Mbps	3.8 Mbps	2 239	2 033
R	eoip-over-bonding-2	EoIP Tunnel	0 bps	1472 bps	0	3
R	eoip-over-bonding-3	EoIP Tunnel	3.6 Mbps	299.2 kbps	598	381
R	eoip-over-bonding-4	EoIP Tunnel	3.2 Mbps	1946.9 kbps	1 837	2 205
R	eoip-over-bonding-5	EoIP Tunnel	0 bps	0 bps	0	0
R	eoip-over-bonding-6	EoIP Tunnel	0 bps	0 bps	0	0
R	ether1	Ethernet	0 bps	1920 bps	0	4
RS	ether2	Ethernet	5.3 Mbps	3.7 Mbps	2 470	2 378
RS	ether3	Ethernet	5.0 Mbps	3.9 Mbps	2 471	2 376
R	ether4	Ethernet	0 bps	0 bps	0	0
R	ether5	Ethernet	6.2 Mbps	8.9 Mbps	4 627	4 685
R	vlan-iix	VLAN	1935.9 kbps	2.7 Mbps	2 180	1 838
R	vlan-telkom	VLAN	278.4 kbps	3.9 Mbps	364	617
R	vlan1	VLAN	3.9 Mbps	2.2 Mbps	2 033	2 239
	;;; remote public					
R	vlan2	VLAN	23.6 kbps	1800 bps	4	3
R	vlan2-backbone	VLAN	1568 bps	0 bps	3	0

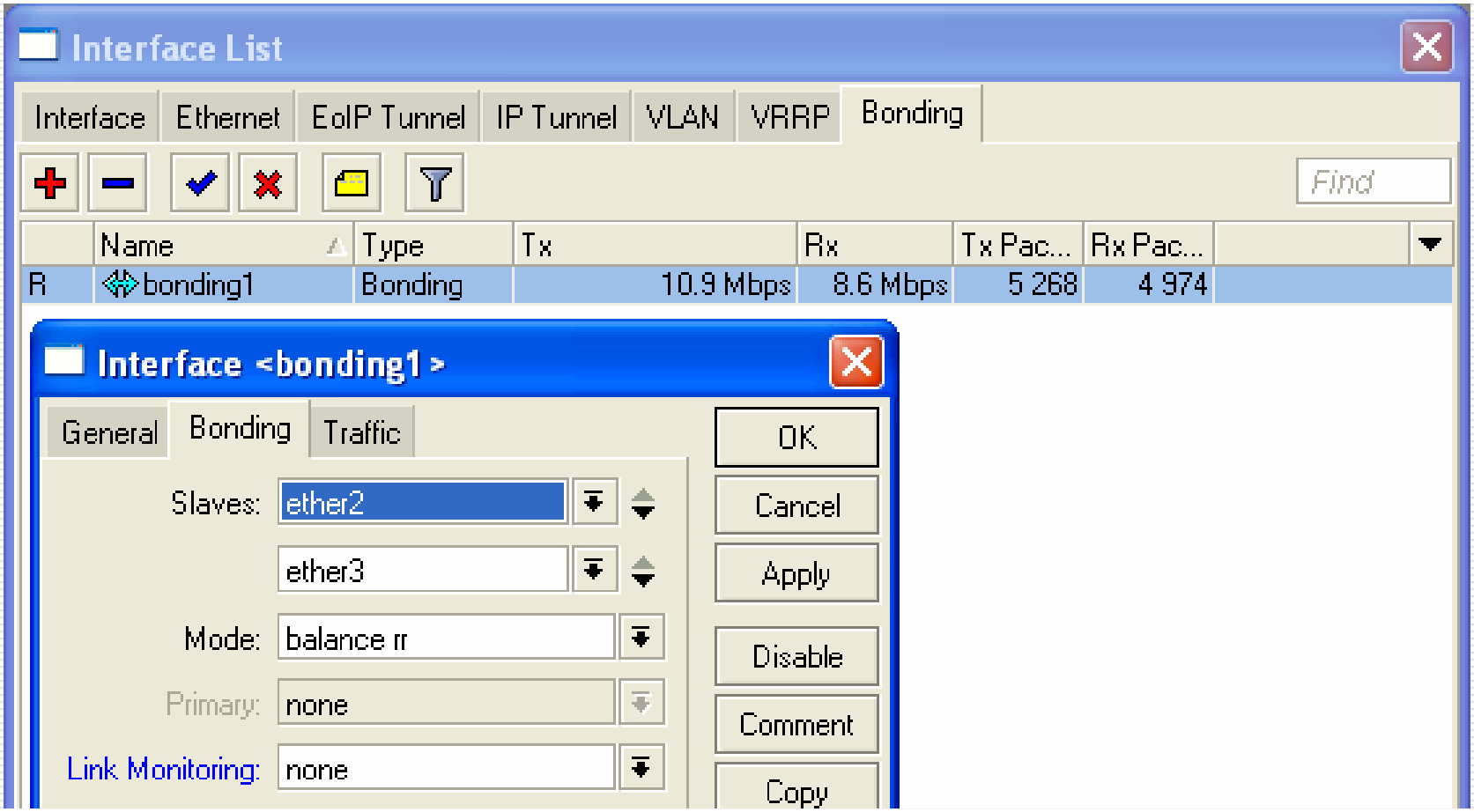
22 items

Bridge Ports Setting



Interface	Bridge	Priority (h...	Path Cost	Horizon	Role
eoip-over-bonding-1	bridge1	80	10		designated port
vlan1	bridge1	80	10		designated port
eoip-over-bonding-2	bridge2	80	10		designated port
vlan2-backbone	bridge2	80	10		designated port
eoip-over-bonding-3	bridge3	80	10		designated port
vlan-telkom	bridge3	80	10		designated port
eoip-over-bonding-4	bridge4	80	10		designated port
vlan-iix	bridge4	80	10		designated port

Bonding Setting



Special Appreciations

- To my fellow ISP Manager Riza Tantular, to do research and designing the migration process using EoIP
- To all my engineers to make simulation how the design will work.

Thank You!

- Valens Riyadi
- Citraweb Nusa Infomedia
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