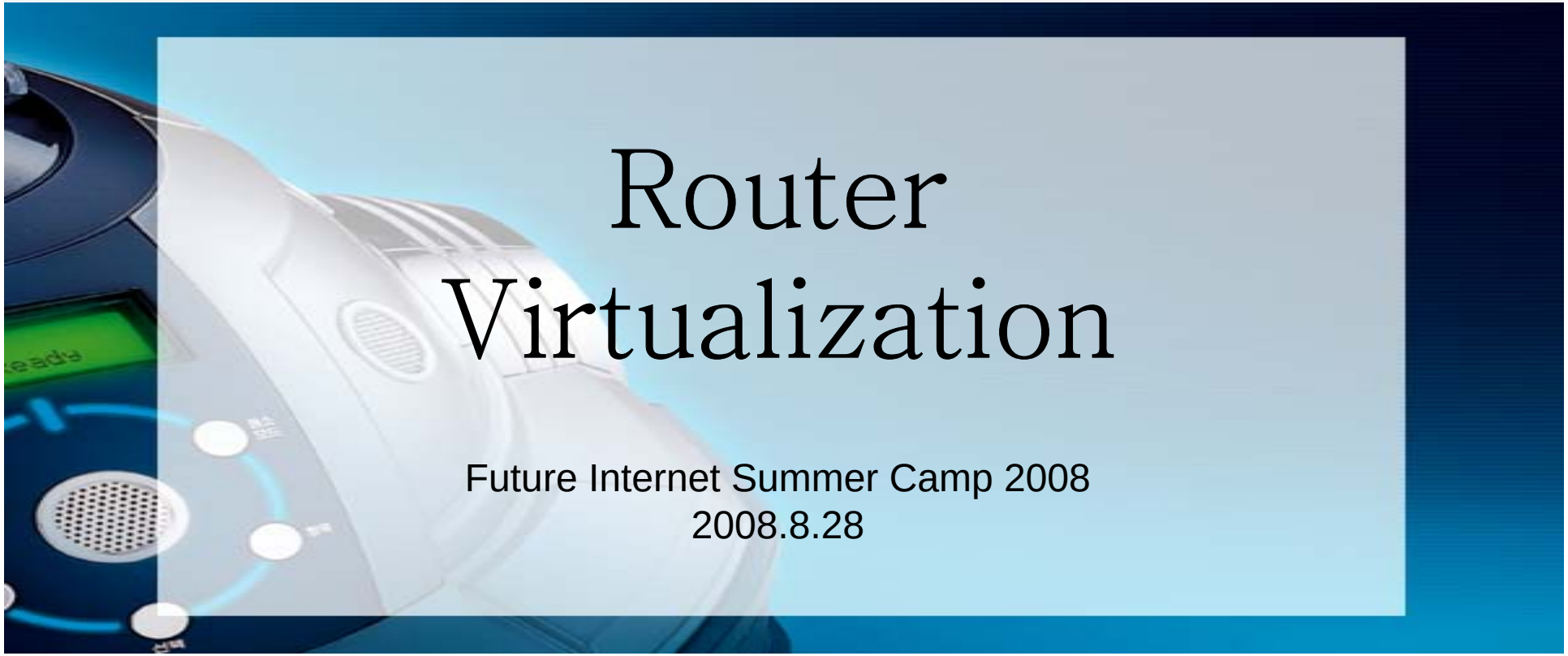


Router Virtualization

Future Internet Summer Camp 2008
2008.8.28

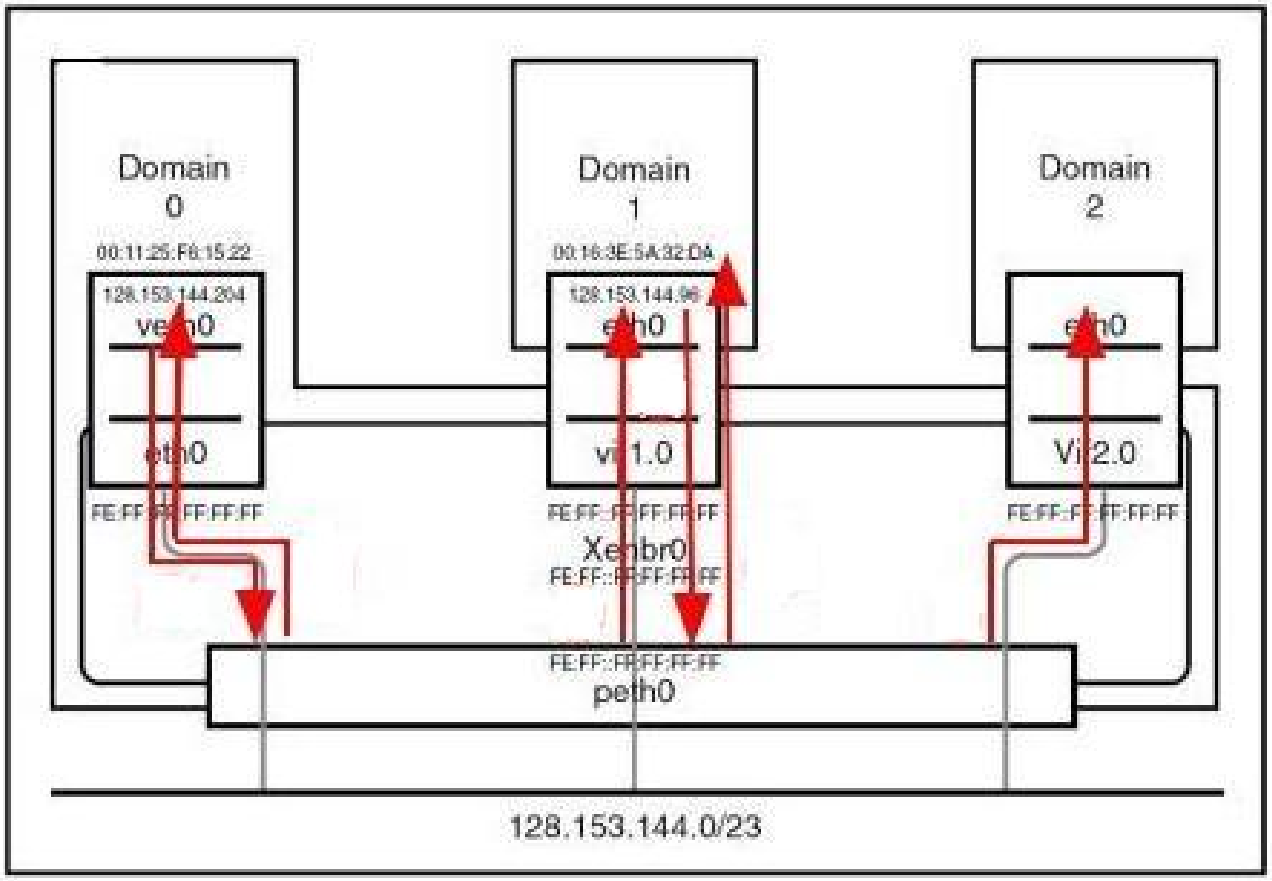
유 성 훈

Xen Network Type

- **Bridging Mode**
  - by MAC address at the link layer.
- **Routing Mode**
  - by IP address at the network layer.
- **NAT (Network Address Translation) Mode**
  - gateway remaps a guest's IP and port to the driver domain's port at the network layer.

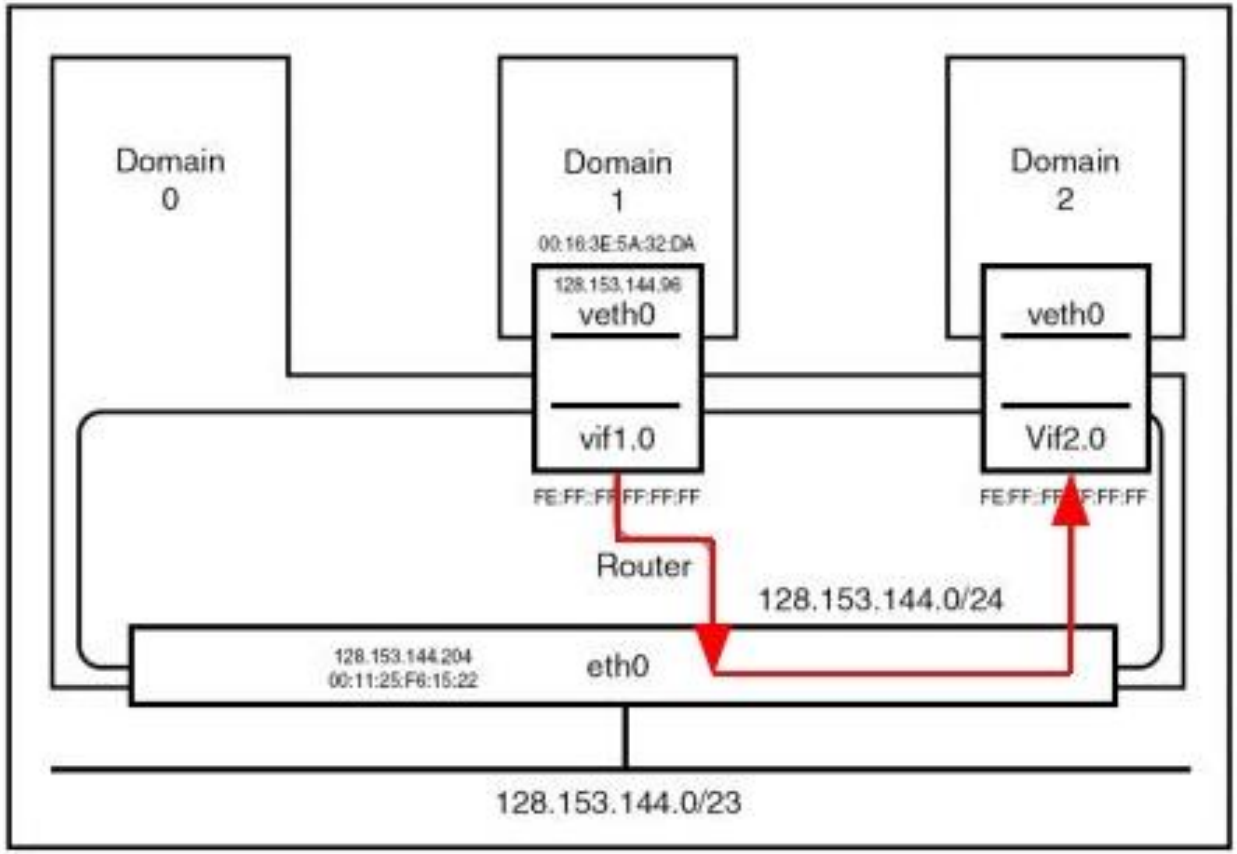
Xen Network Type

- **Bridging Mode**



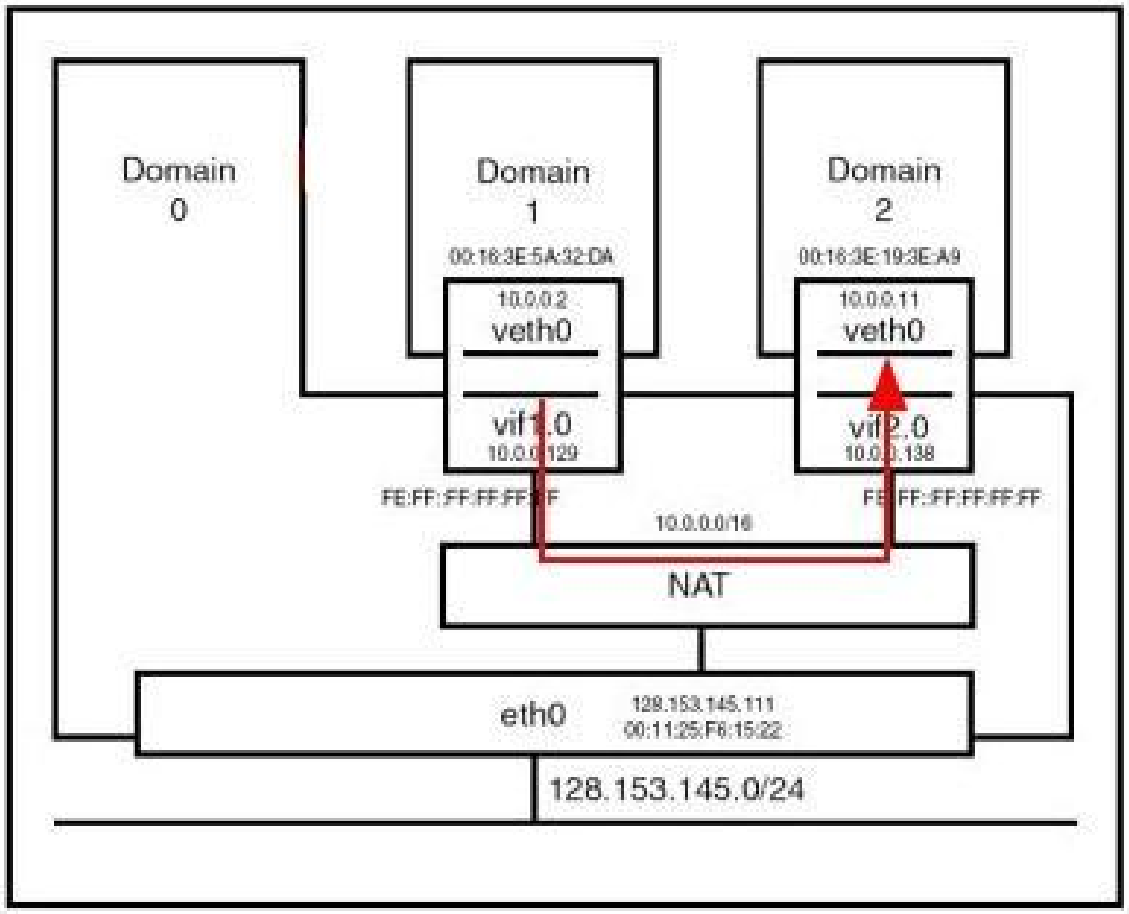
Xen Network Type

- **Routing Mode**



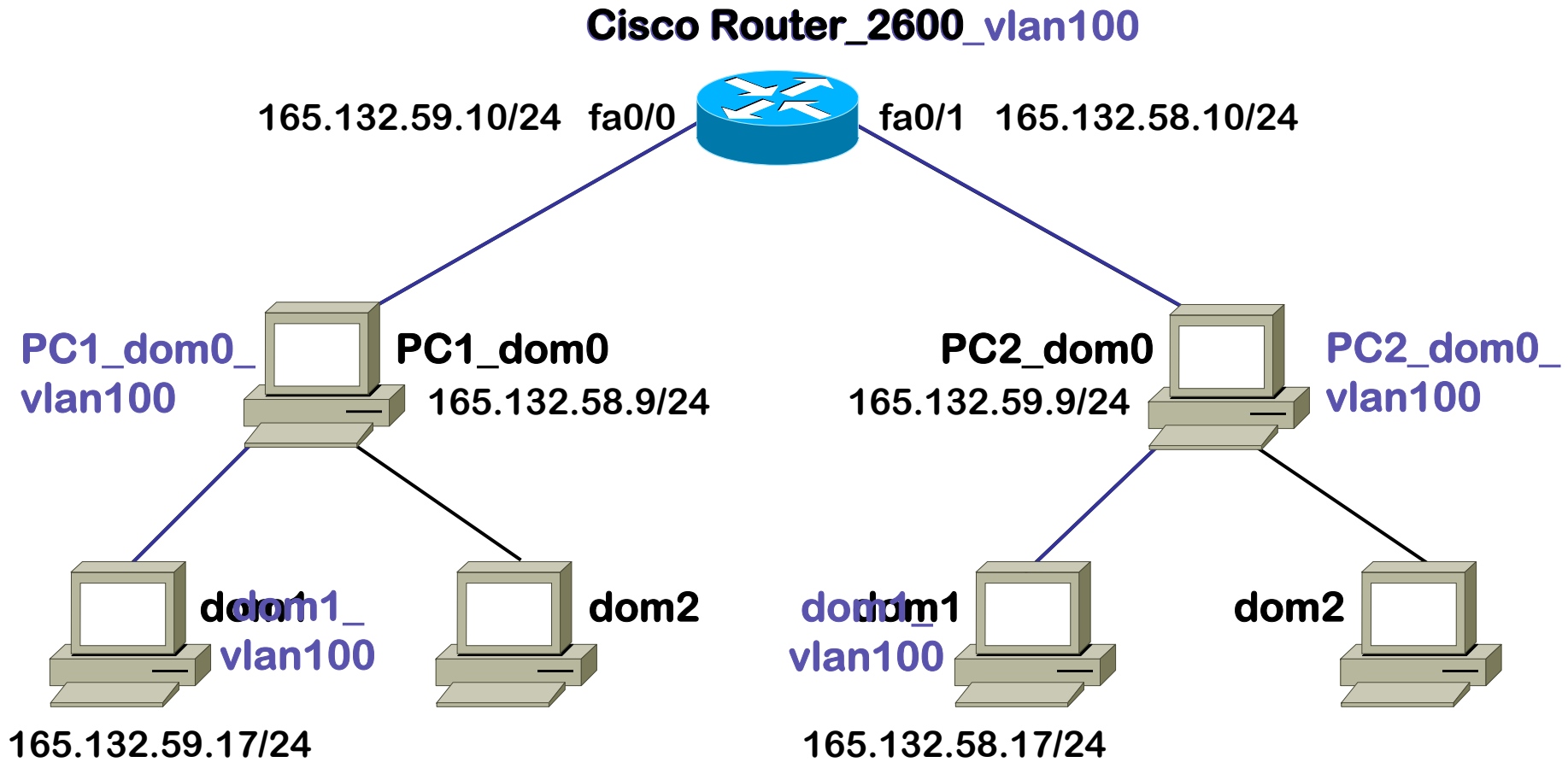
Xen Network Type

- **NAT Mode**



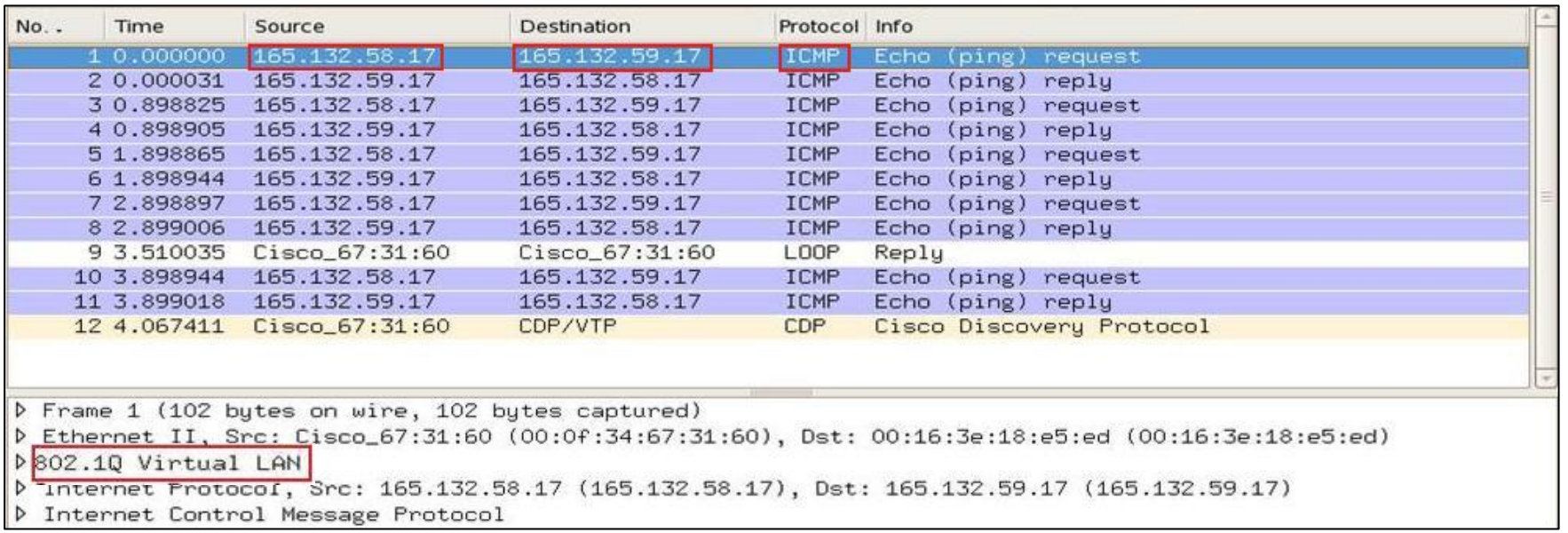
Separated Vlan Network by Xen

- **Topology**



Separated Vlan Network by Xen

- **Result**
  - PC1의 dom_1으로부터 PC2의 dom1으로 ICMP Ping Test



No.	Time	Source	Destination	Protocol	Info
1	0.000000	165.132.58.17	165.132.59.17	ICMP	Echo (ping) request
2	0.000031	165.132.59.17	165.132.58.17	ICMP	Echo (ping) reply
3	0.898825	165.132.58.17	165.132.59.17	ICMP	Echo (ping) request
4	0.898905	165.132.59.17	165.132.58.17	ICMP	Echo (ping) reply
5	1.898865	165.132.58.17	165.132.59.17	ICMP	Echo (ping) request
6	1.898944	165.132.59.17	165.132.58.17	ICMP	Echo (ping) reply
7	2.898897	165.132.58.17	165.132.59.17	ICMP	Echo (ping) request
8	2.899006	165.132.59.17	165.132.58.17	ICMP	Echo (ping) reply
9	3.510035	Cisco_67:31:60	Cisco_67:31:60	LOOP	Reply
10	3.898944	165.132.58.17	165.132.59.17	ICMP	Echo (ping) request
11	3.899018	165.132.59.17	165.132.58.17	ICMP	Echo (ping) reply
12	4.067411	Cisco_67:31:60	CDP/VTP	CDP	Cisco Discovery Protocol

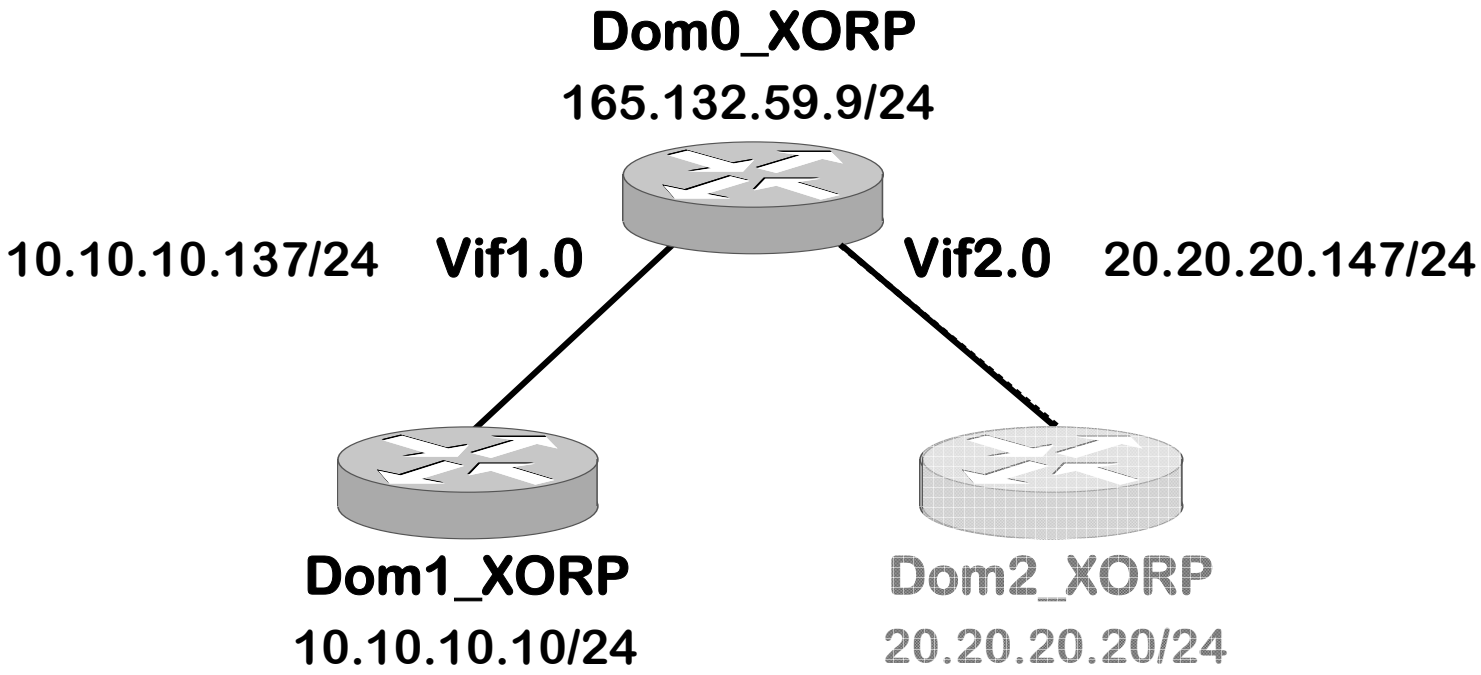
```
▷ Frame 1 (102 bytes on wire, 102 bytes captured)
▷ Ethernet II, Src: Cisco_67:31:60 (00:0f:34:67:31:60), Dst: 00:16:3e:18:e5:ed (00:16:3e:18:e5:ed)
▷ 802.1Q Virtual LAN
▷ Internet Protocol, Src: 165.132.58.17 (165.132.58.17), Dst: 165.132.59.17 (165.132.59.17)
▷ Internet Control Message Protocol
```

PC1_dom1과 PC2_dom1이 802.1Q vlan tag가 붙어서 정상적으로 통신됨

➡ Xen위에서 vlan을 이용하여 각각 독립된 망 구성 가능

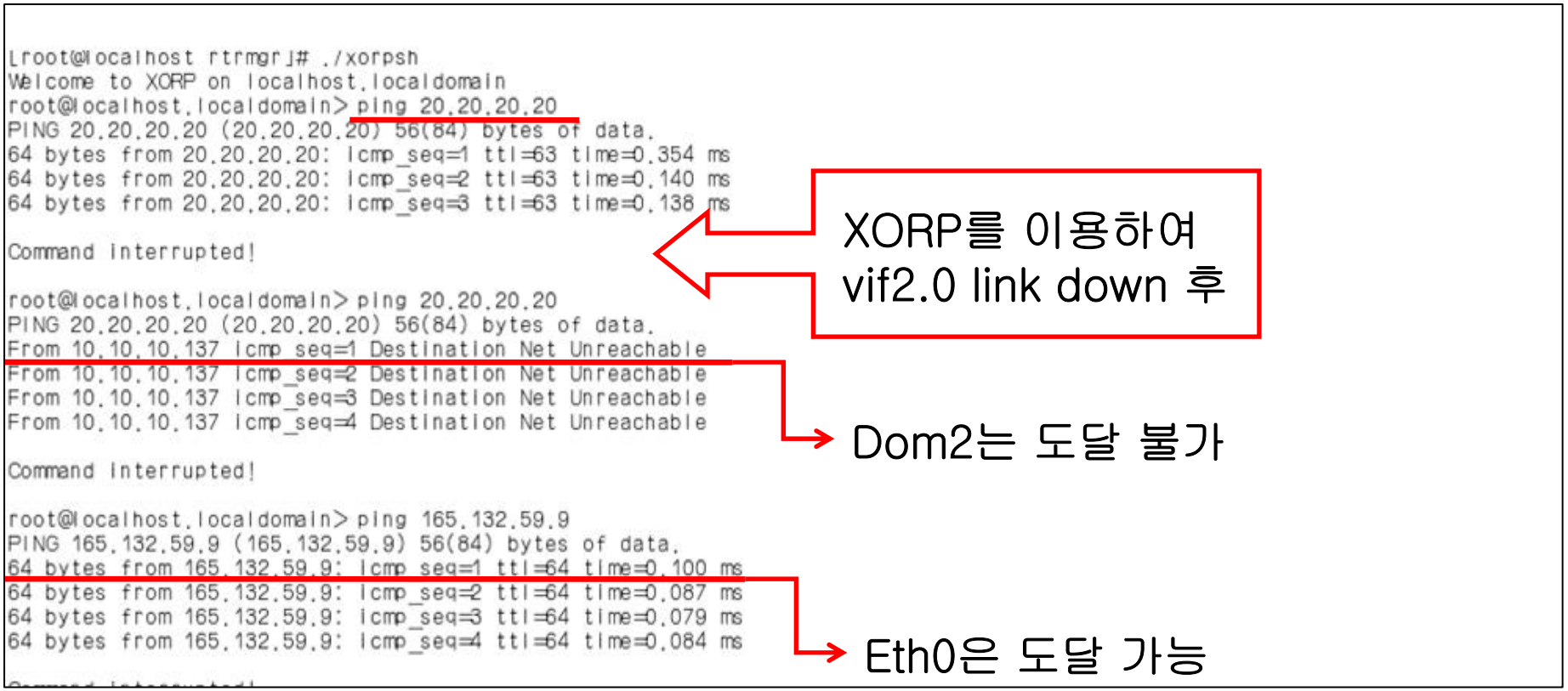
Networking by XORP

- XORP의 routing 기능 확인



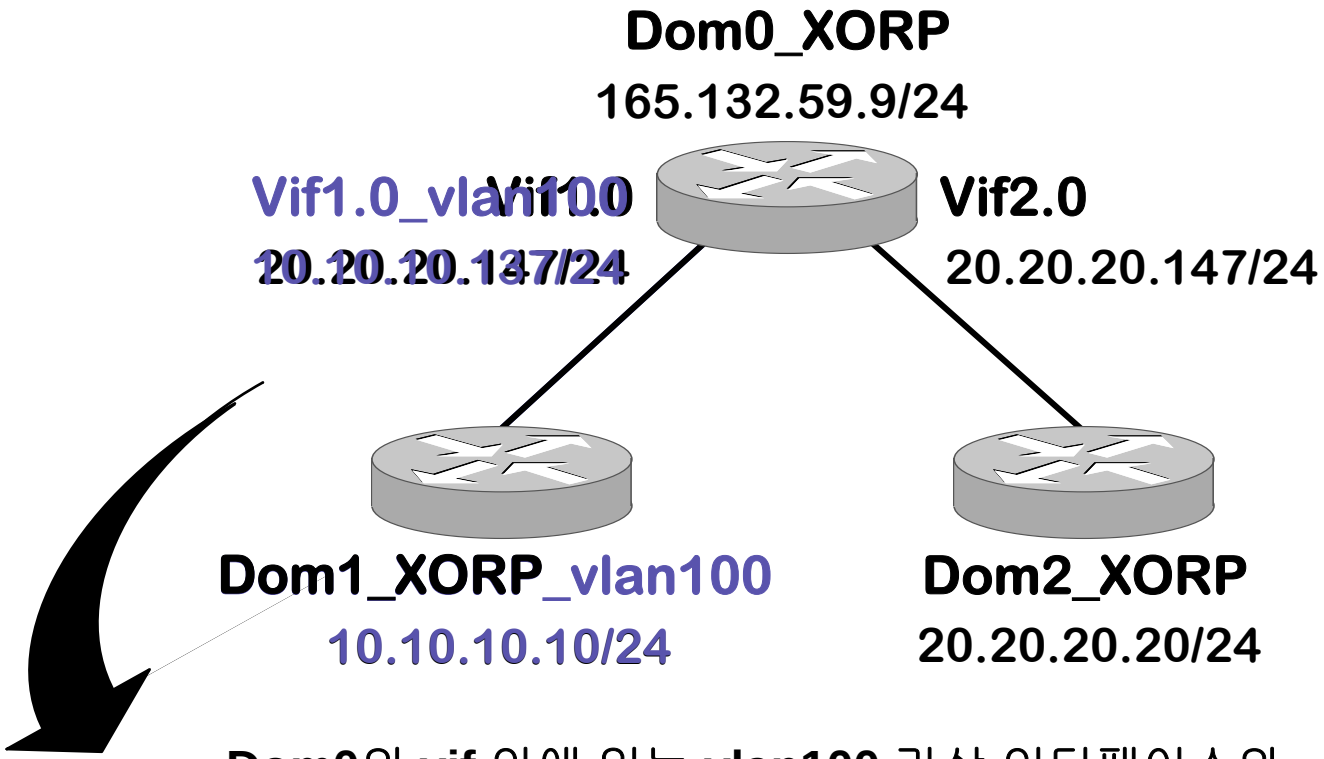
Networking by XORP

- dom1에서 dom2로의 Ping Test



Vlan Configure by XORP

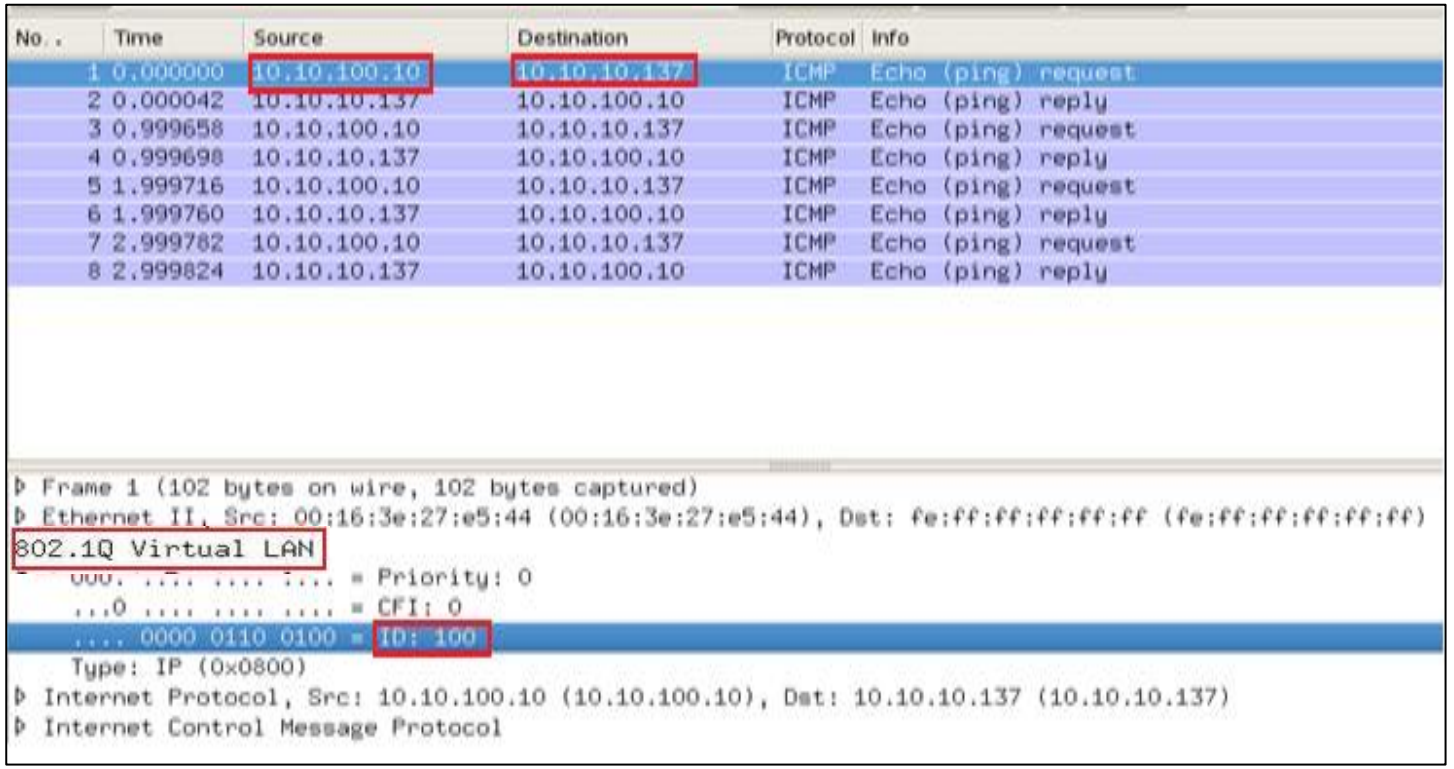
- **Topology**



Dom0의 **vif** 안에 있는 **vlan100** 가상 인터페이스와
Dom1의 **vlan100** 가상 인터페이스와 연결

Vlan Configure by XORP

- dom1에서 dom2로의 Ping Test



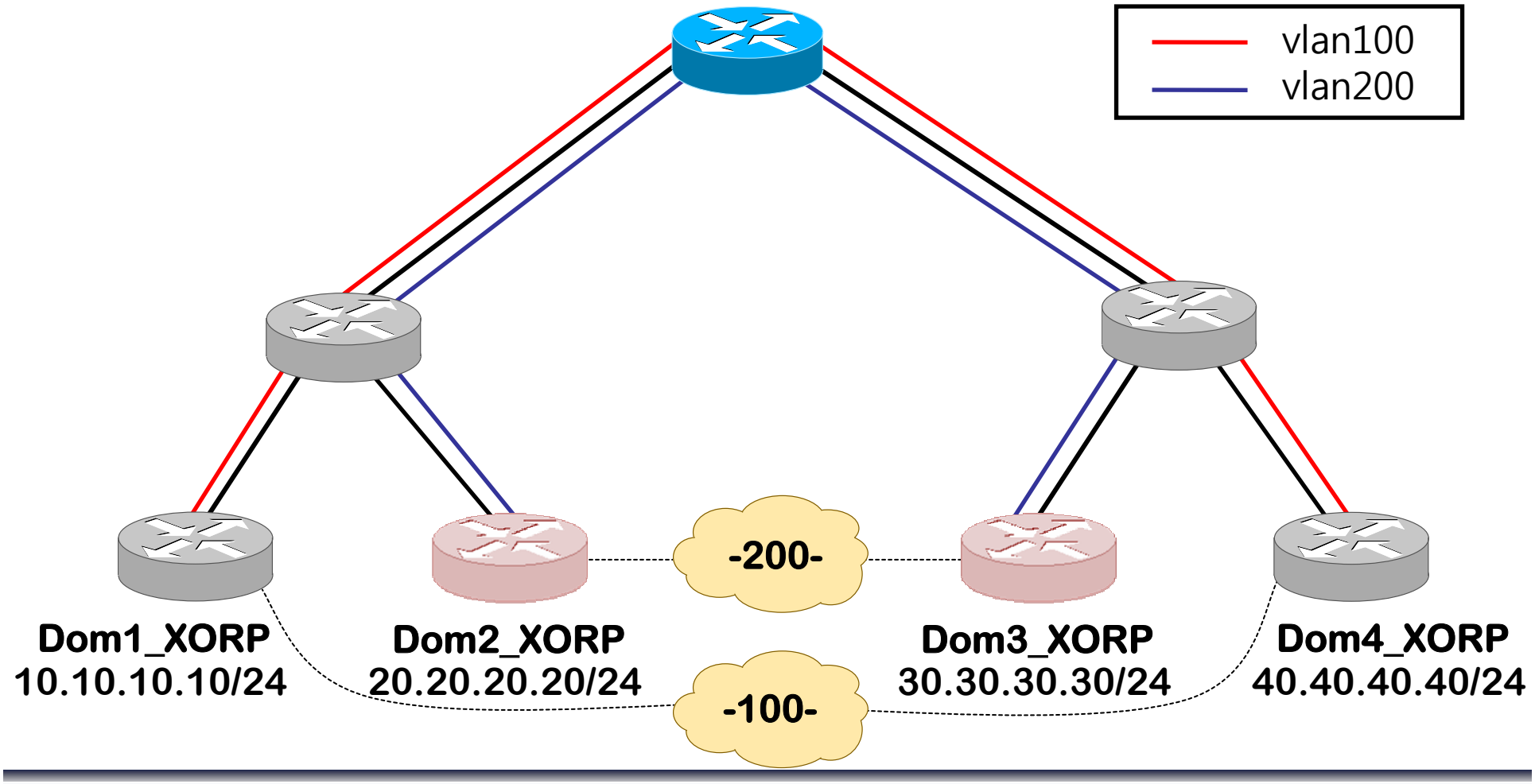
802.1Q Protocol…… Vlan 구성

Vlan Configure by XORP

- **Result**
  - XORP 상에서 구성한 config 및 동작이 Xen의 physical layer에도 반영됨.
  - XORP의 console에서 protocol encapsulation (e.g. 802.1q VLAN) 구성 시 Xen의 가상 인터페이스에 반영됨.
  - 여러 개의 가상 라우터를 만든 후 각각의 가상인터페이스를 VLAN으로 분류하여 가상 네트워크 구성 가능.

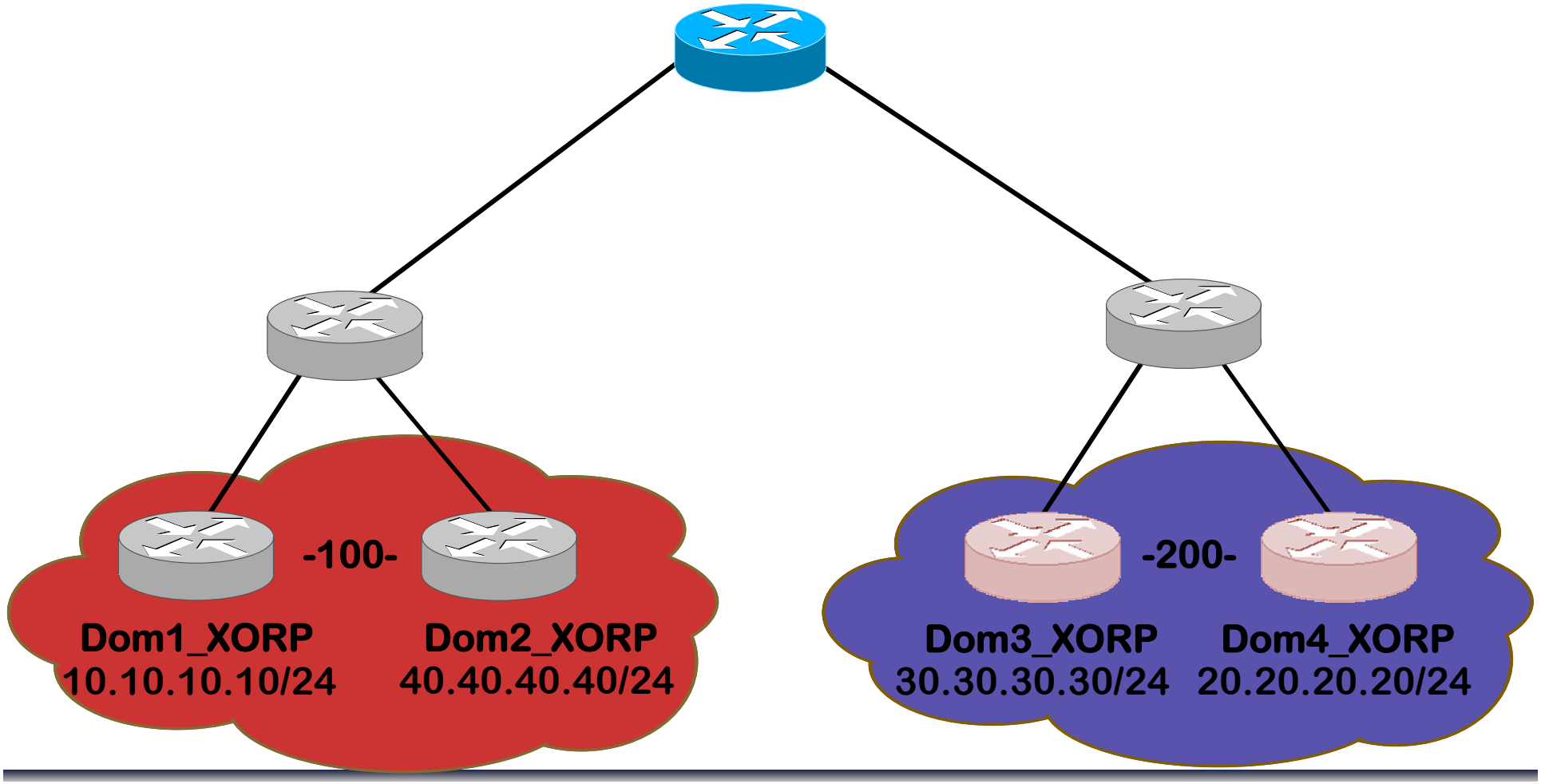
Vlan Configure by XORP

- **Vlan Physical Topology**



Vlan Configure by XORP

- **Vlan Logical Topology**



5 Conclusion

- **Xen**을 이용하여 **Virtual machine** 생성.
- **Virtual machine**에 **XORP** 라우터를 올려 가상 라우터 망 구성.
- 가상 라우터 망에서 **Vlan**을 이용하여 각각 독립된 망 구성.
- **Physical**하게는 멀리 떨어져 있는 라우터를 **logical**하게는 같은 망에 있는 것처럼 구성.