Wireless LAN
CO72047

Unit 7: VLANs and 802.1q Trunking

Prof. Bill Buchanan

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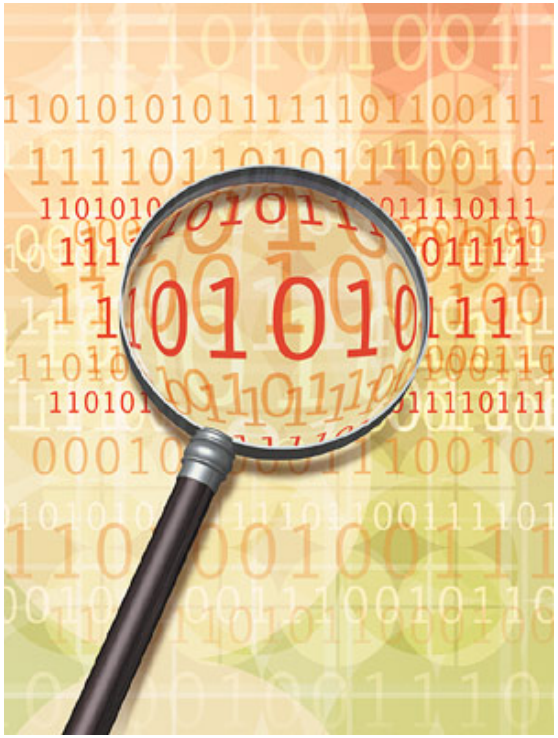
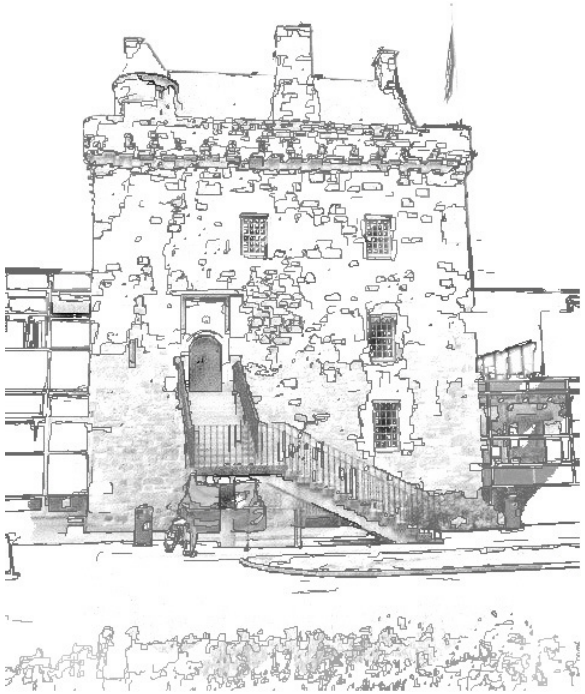
Module Descriptor





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Week	Date	Academic	Cisco	Lab/Tutorial
1	1 Oct	1**: Radio Wave Fundamentals**		
2	8 Oct	**2: Wireless Fundamentals**	Intro to Wireless LANs	Lab 1/2: Access Point Tutorial 1 (T)
3	15 Oct	**3: Ad-hoc and Infrastructure Networks**	IEEE 802.11 and NICs	Lab 3: Ad-hoc Networks
4	22 Oct	**4: Encryption**	Wireless Radio Technology	Lab 4: Infrastructure Networks
5	29 Oct	**5: Authentication**	Wireless Topologies	Lab 5: Remote Connections
6	5 Nov	**6: Antennas**	Access Points	Lab 6: Encryption/Authen
7	12 Nov	**7: Filtering/8. VLANs**	Bridges	Lab 7: Filter
8	19 Nov	**Napier Test (40%)**	Antennas	Lab 8: VLAN
9	26 Nov		Security	Lab 9: VLAN/802.1Q
10	3 Dec	Cisco Academy/Additional Material	Applications	Lab 10: IP Routing
11	10 Dec	Cisco Academy /Additional Material	Site Survey	Lab 11: RADIUS
12	17 Dec	Cisco Academy /Additional Material	Troubleshooting	Lab 12: SNMP
Holidays				
13	7 Jan	Revision/Cram (Cisco Exam)	Emerging Technologies	**Coursework/Practical (50%)**
14	14 Jan	Revision/Cram (Cisco Exam)	**Cisco Exam (10%)**	
15	21 Jan			

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SWSCUST Module Individual - Windows Internet Explorer

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SWSCUST Module Individual

Module: co72047 - Wireless LANs

Weeks: 0-12, 13-15 (24 Sep 2007-27 Jan 2008)

	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00
Mon												
Tue												
Wed	Prof William Buchanan Merch.F27 co72047.L01 1-12, 13		Prof William Buchanan, Mr Jamie Graves, Mr Merch.co.C6 Lionel Saliou co72047.P03 1-12, 13-15	Prof William Buchanan, Mr Jamie Graves, Mr Merch.co.C6 Lionel Saliou co72047.P01 1-12, 13-15		Prof William Buchanan, Mr Jamie Graves, Mr Merch.co.C6 Lionel Saliou co72047.P02 1-12, 13-15			Prof William Buchanan, Mr Jamie Graves, Mr Merch.co.C6 Lionel Saliou co72047.P04 1-12, 13-15			
Thu	Merch.co.C6 co72047.U01 1-12, 13-15											
Fri												
Sat												
Sun												

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Template: SWSCUST Module Individual

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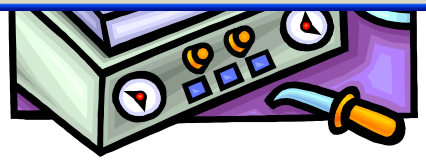


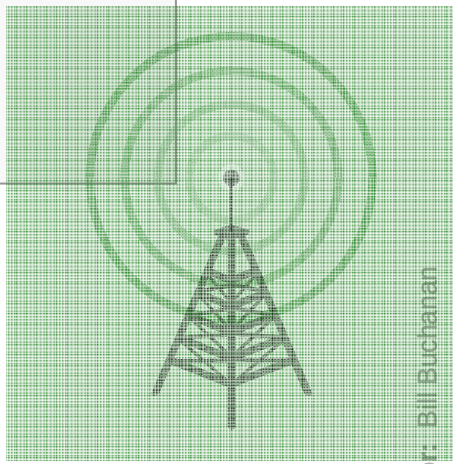
Wireless connections … which technology?

Areas covered:

VLANs

IEEE 802.1q

GSM/3G



Virtual LANs

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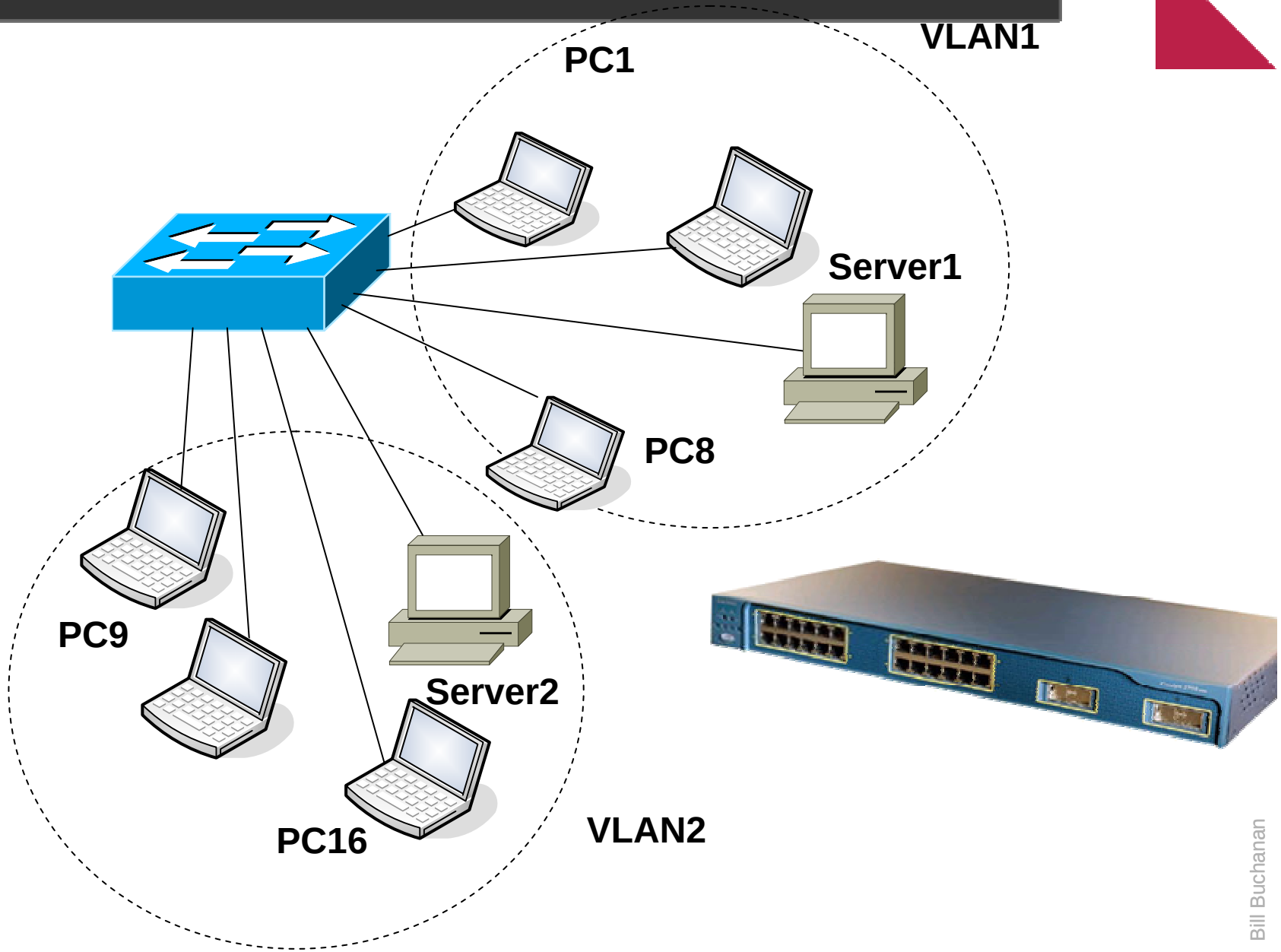

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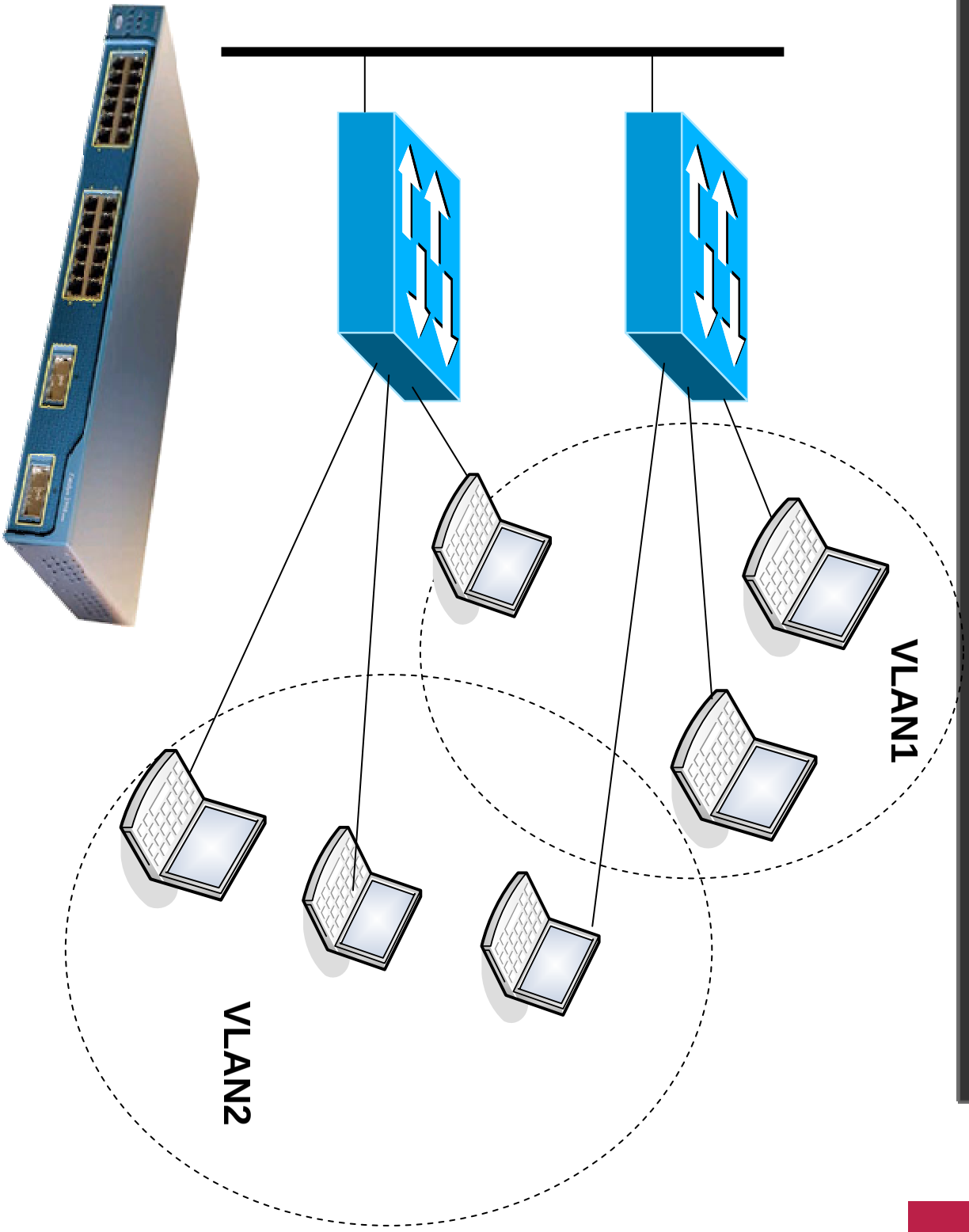

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Why VLANs?

Creation of virtual networks. Just as many organizations build open-plan offices which can be changed when required, vLANs can be used to reconfigure the logical connections to a network without actually having to physically move any of the resources.

Ease of administration. vLANs allow networks to be easily configured, possibly at a distance from the configured networks. In the past reconfiguration has meant recabling and the movement of networked resources.

Improved bandwidth usage. Normally users who work in a similar area share resources. This is typically known as a workgroup. If workgroups can be isolated from other workgroups then traffic which stays within each of the workgroups does not affect other workgroups. A vLAN utilizes this concept by grouping users who share information and configuring the networked resources around them.

Why VLANs?

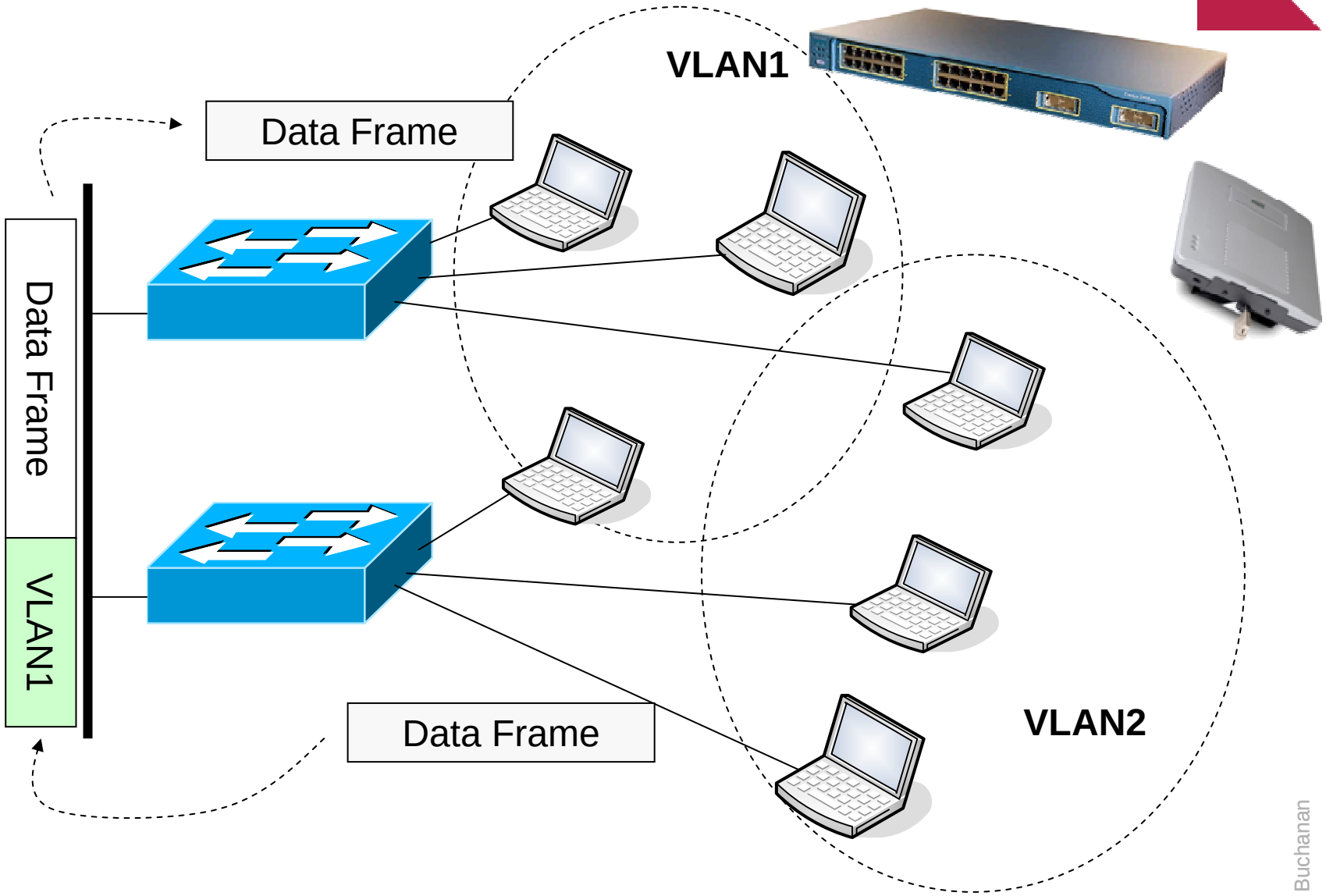
Microsegmentation. This involves dividing a network into smaller segments, which will increase the overall bandwidth available to networked devices.

Enhanced security. vLANs help to isolate network traffic so that traffic which stays within a vLAN will not be transmitted outside it. Thus it is difficult for an external user to 'listen' to any of the data that is transmitted across the vLAN, unless they can get access to one of the ports of the vLAN device.

Relocate servers into secured locations. vLANs allows for servers to be put in a physical location in which they cannot be tampered with. This will typically be in a secure room, which is under lock and key. The vLAN can be used to map hosts to servers.

Easy creation of IP subnets. vLANs allow the creation of IP subnets, which are not dependent on the physical location of a node. Users can also remain part of a subnet, even if they move their computer.

IEEE 802.1q



Ethernet Data frame

Ethernet II

Preamble	Dst MAC (6 bytes)	Src MAC (6 bytes)	Ethertype (2 bytes)	Data (46-1500)	FCS (4 bytes)

0x0800	**Internet Protocol, Version 4 (IPv4)**
0x0806	**Address Resolution Protocol (ARP)**
0x8035	Reverse Address Resolution Protocol (RARP)
0x809b	AppleTalk (Ethertalk)
0x80f3	AppleTalk Address Resolution Protocol (AARP)
0x8100	**IEEE 802.1Q-tagged frame**
0x8137	Novell IPX (alt)
0x8138	Novell
0x86DD	Internet Protocol, Version 6 (IPv6)
0x8863	PPPoE Discovery Stage
0x8864	PPPoE Session Stage
0x888E	EAP over LAN (IEEE 802.1X)

IEEE 802.1Q

Author: B

Ethernet Data frame

Ethernet II

Preamble	Dst MAC (6 bytes)	Src MAC (6 bytes)	Ethertype (2 bytes)	Data (46-1500)	FCS (4 bytes)

0x0800	**Internet Protocol, Version 4 (IPv4)**
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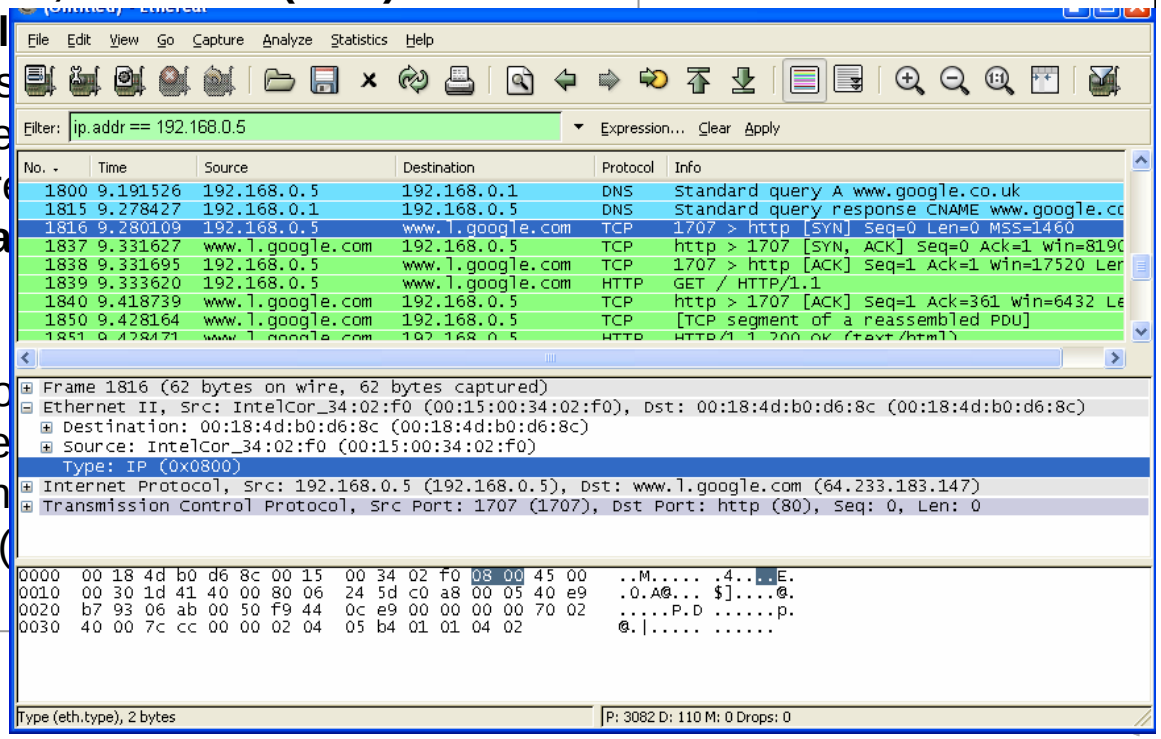

Ethernet Data frame

CFI – Canical Format ID

Ethernet II

Preamble	Dst MAC (6 bytes)	Src MAC (6 bytes)	Ethertype (2 bytes)	Data (46-1500)	FCS (4 bytes)

Preamble	Dst MAC (6 bytes)	Src MAC (6 bytes)	Ethertype 0x8100		FCS (4 bytes)

User priority (3-bits)	CFI (1 bit)	VLAN ID (12-bit)	Ethertype (2 bytes)	Data (46-1500)

16-bit

IEEE 802.1Q

Static vLANs. These are ports on a switch that are statically assigned to a VLAN. These remain permanently assigned, until they are changed by the administrator. Static vLANs are secure and easy to configure, and are useful where vLANs are fairly well defined.

Dynamic VLANs. These are ports on a switch which automatically determine their VLAN assignments. This is achieved with intelligent management software, using MAC addresses, logical addressing, or the protocol type of the data packets. Initially, where a node connects to the switch, the switch detects its MAC address entry in the VLAN management database and dynamically configures the port with the corresponding VLAN configuration. The advantage of dynamic vLANs is that they require less setup from the administrator (but the database must be initially created).

VLAN types

Port-Based VLAN. Port defines the VLAN.

MAC-based VLAN. MAC addresses define the membership.

Protocol-based VLAN. Defined by Layer 3 protocol, such as for IP or IPX.

SSID-based. This defines that certain nodes which authenticate to a certain SSID are part of a VLAN.

ATM VLAN. This maps Ethernet packets into ATM cells.

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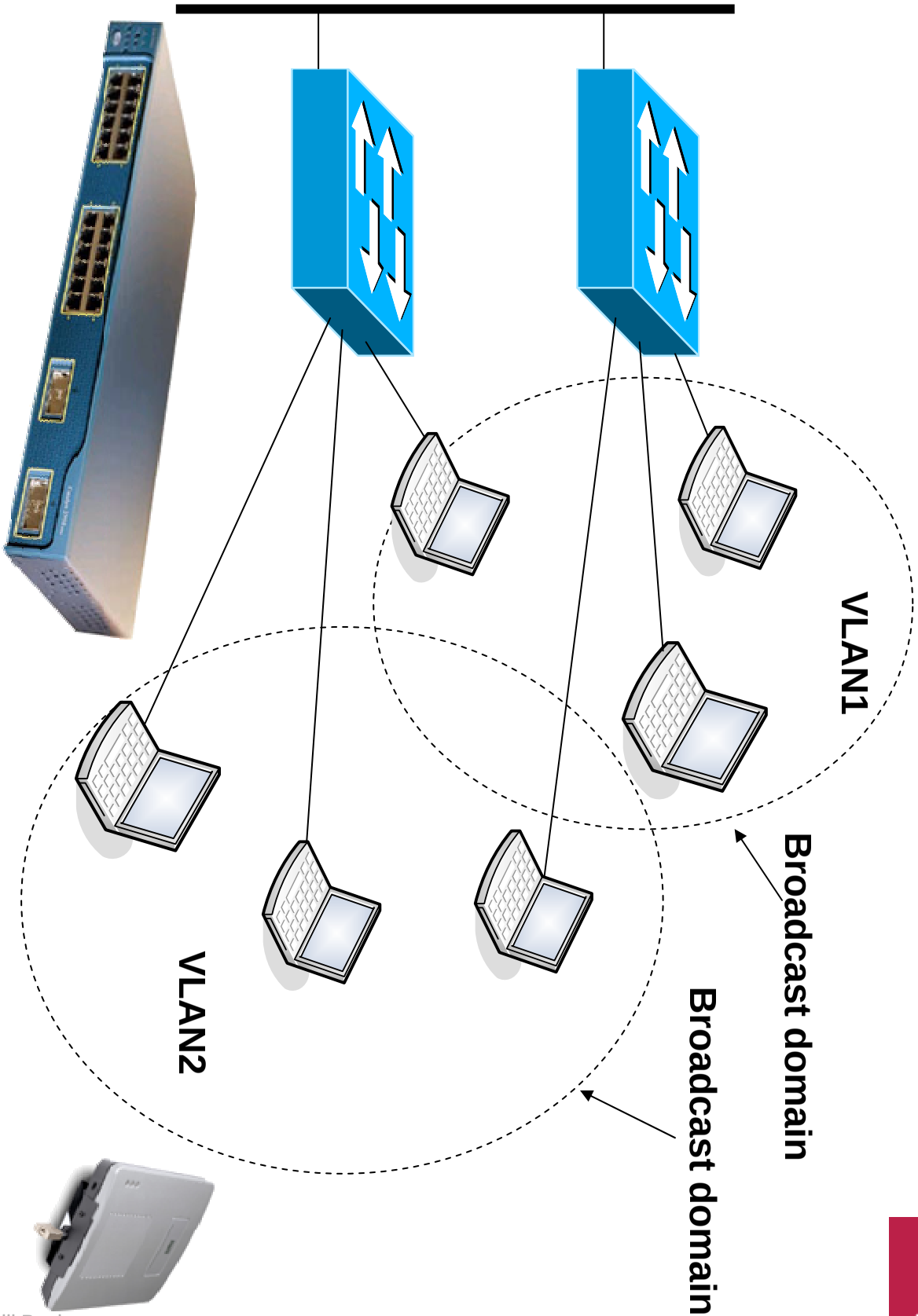

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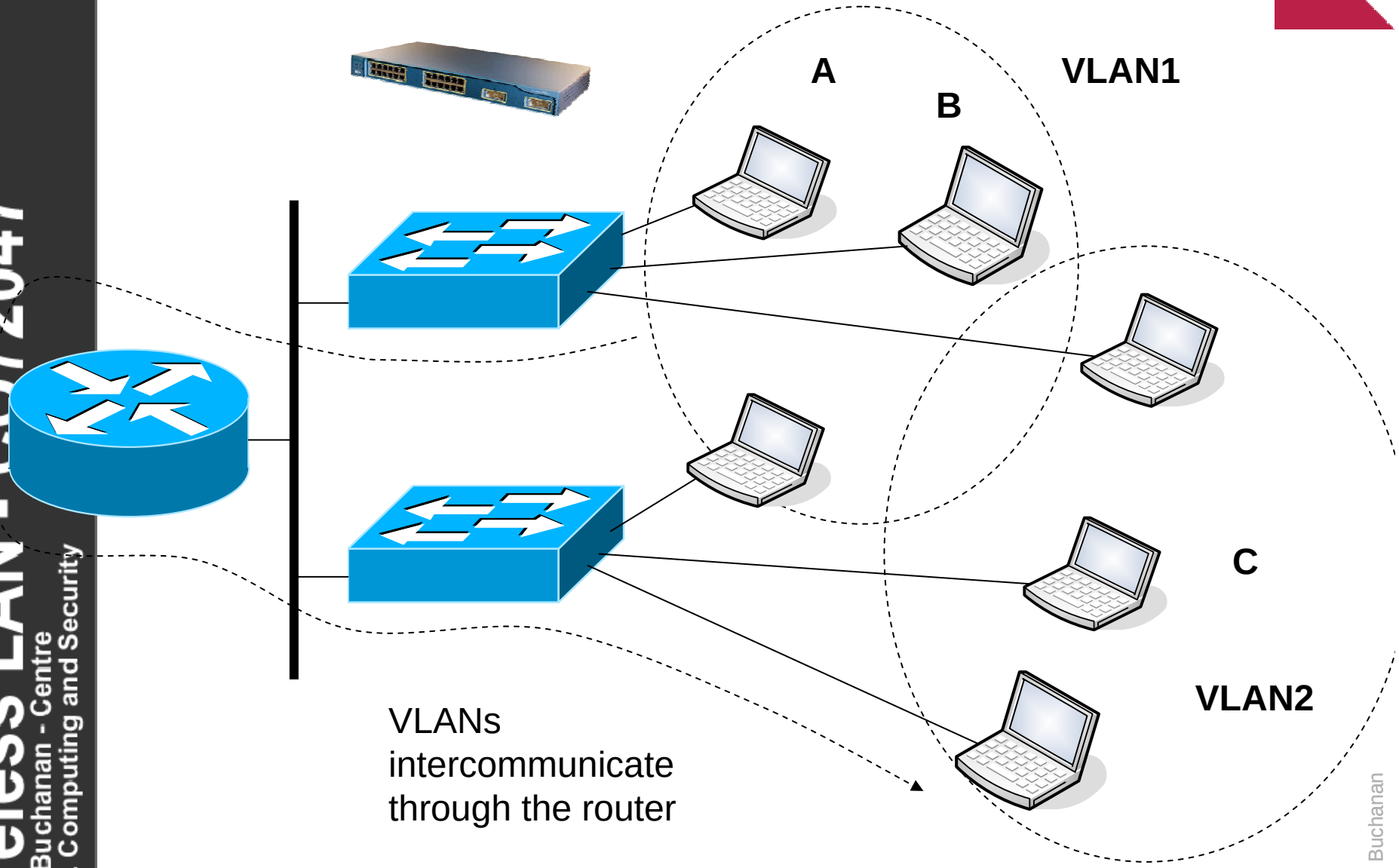

VLANs intercommunicate through the router

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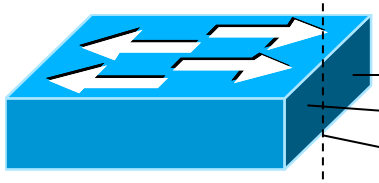
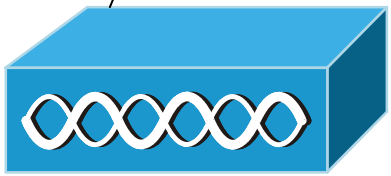
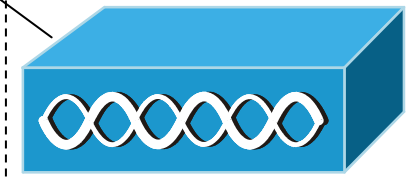
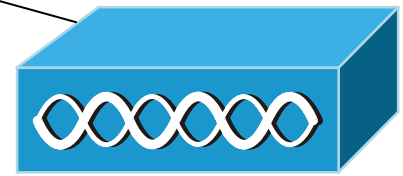


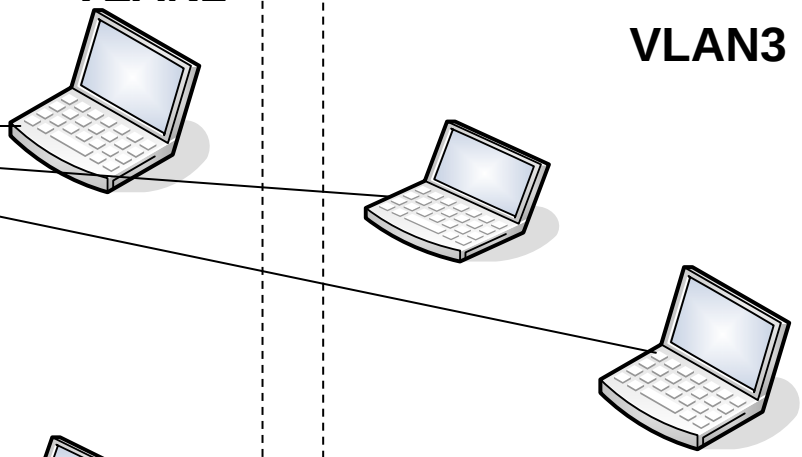


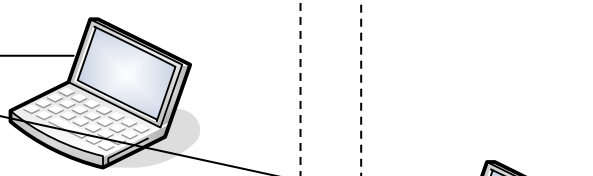




VLAN2

VLAN3





SSID: VLAN1

SSID: VLAN2

SSID: VLAN3

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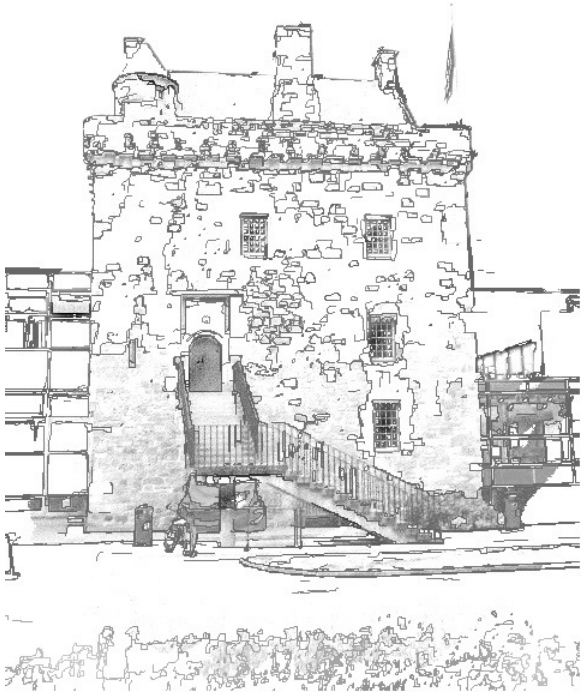
Lab Topology



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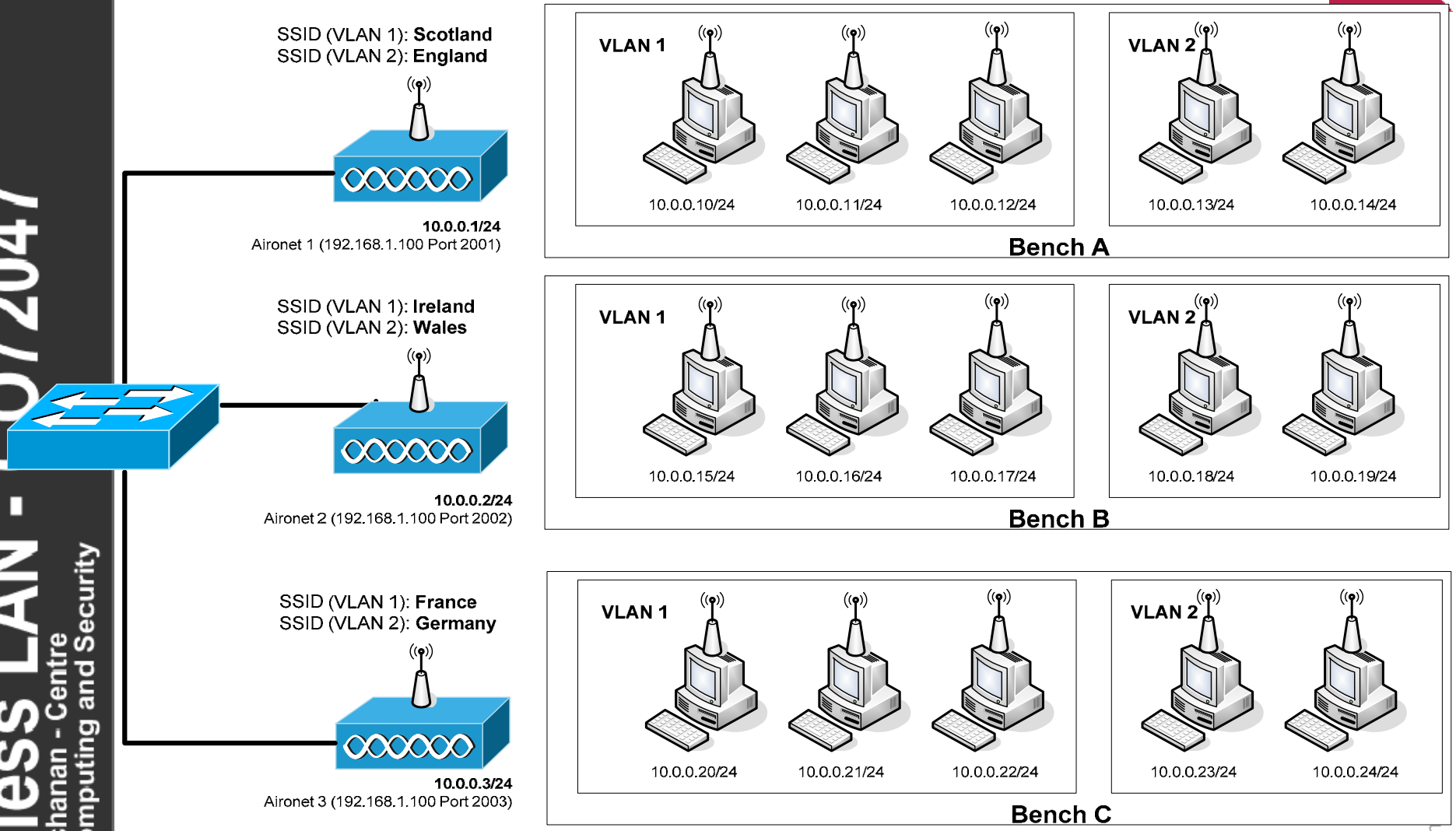

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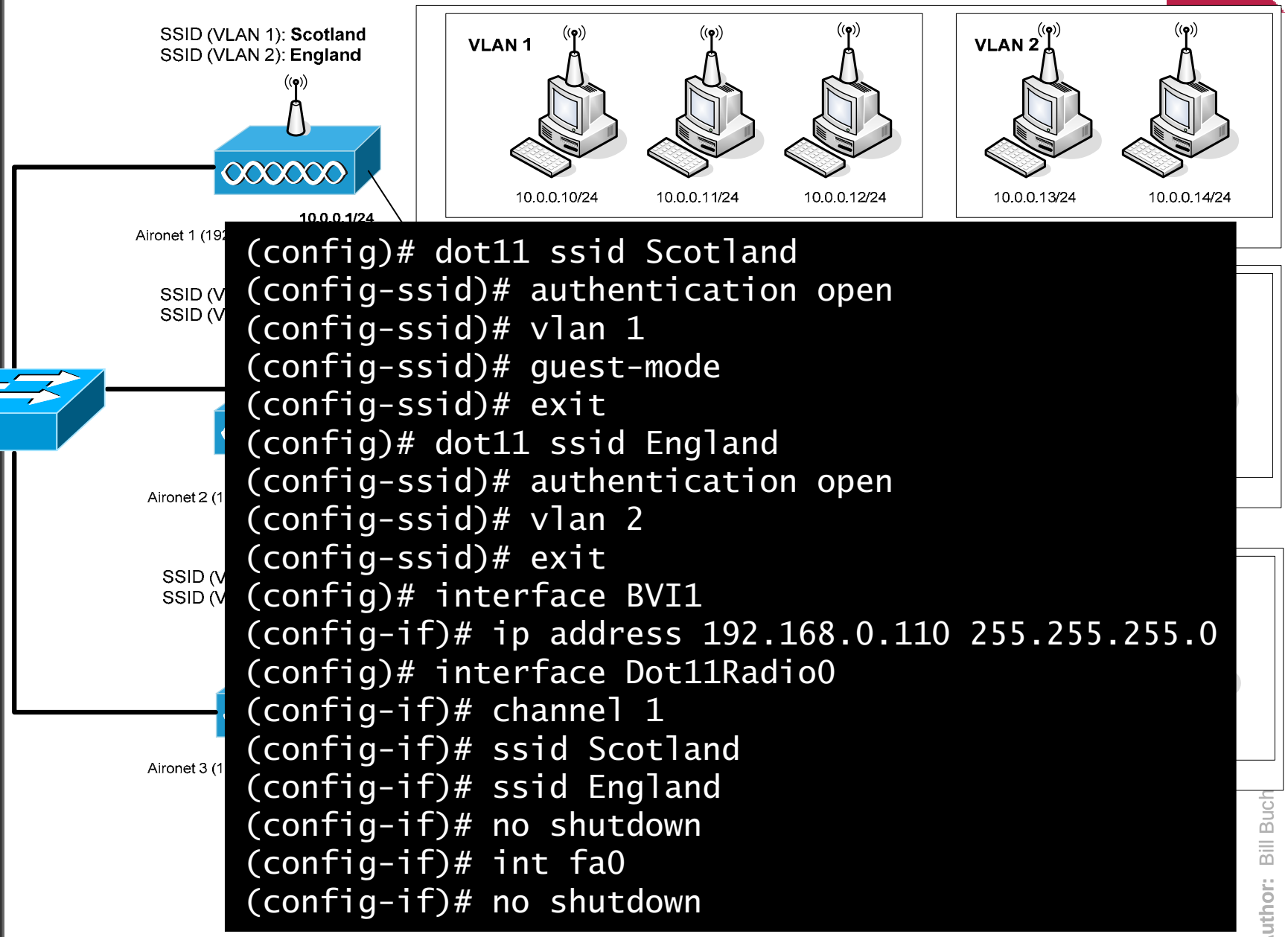


```
(config)# dot11 ssid Scotland
(config-ssid)# authentication open
(config-ssid)# vlan 1
(config-ssid)# guest-mode
(config-ssid)# exit
(config)# dot11 ssid England
(config-ssid)# authentication open
(config-ssid)# vlan 2
(config-ssid)# exit
(config)# interface BVI1
(config-if)# ip address 192.168.0.110 255.255.255.0
(config)# interface Dot11Radio0
(config-if)# channel 1
(config-if)# ssid Scotland
(config-if)# ssid England
(config-if)# no shutdown
(config-if)# int fa0
(config-if)# no shutdown
```

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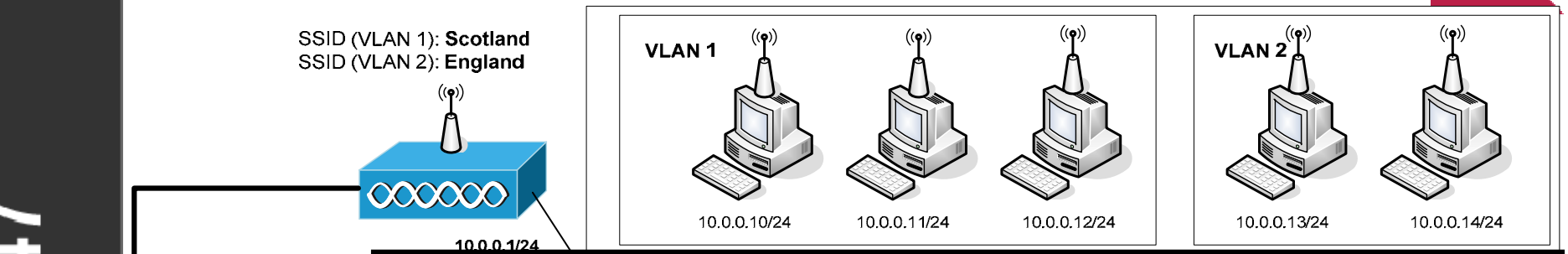
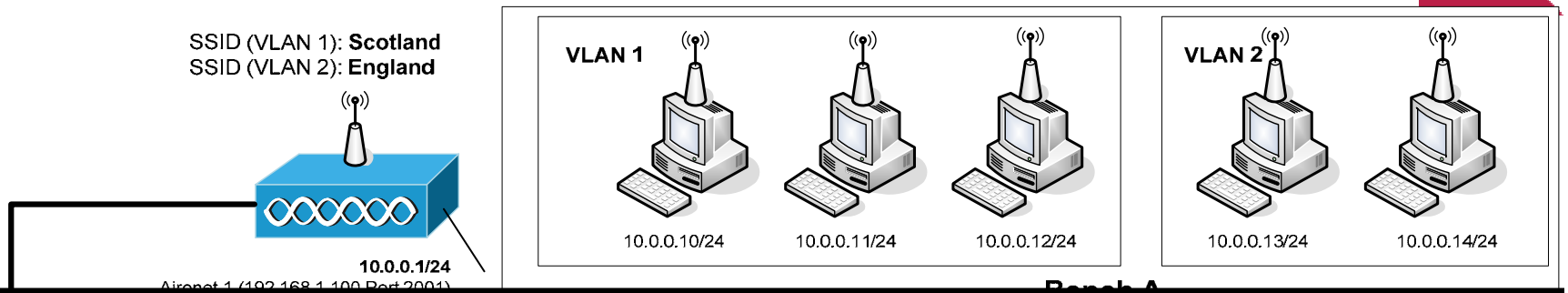
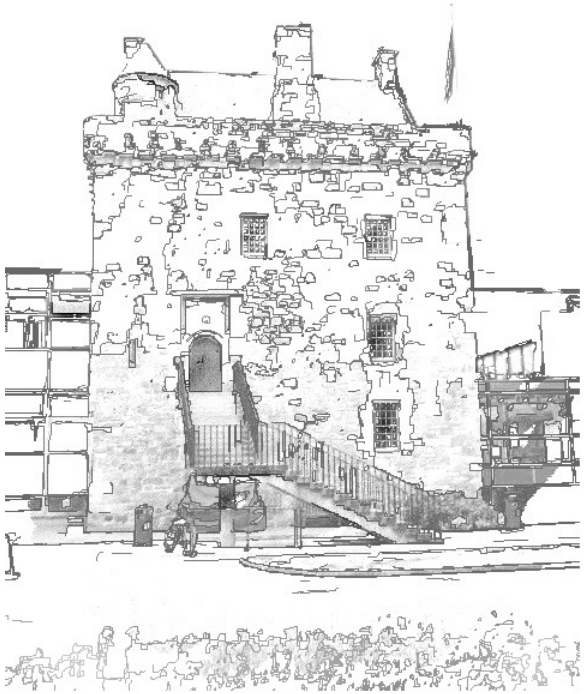



```
(config)# interface Dot11Radio0.1
(config-subif)# ?
Interface configuration commands:
. . .
  encapsulationSet encapsulation type for an interface
. . .
(config-subif)# encapsulation ?
  dot1Q  IEEE 802.1Q Virtual LAN
(config-subif)# encapsulation dot1q ?
  <1-4094>  IEEE 802.1Q VLAN ID
(config-subif)# encapsulation dot1q 1 ?
  native        Make this as native vlan
  <cr>
(config-if)# encapsulation dot1q 1 native
(config-if)# bridge-group 1
(config-if)# interface Dot11Radio0.2
(config-if)# encapsulation dot1q 2
(config-if)# bridge-group 2
```




```
# show vlan
Virtual LAN ID:  1 (IEEE 802.1Q Encapsulation)
   vLAN Trunk Interfaces:  Dot11Radio0.1
Virtual-Dot11Radio0.1
 This is configured as native Vlan for the following int(s):
Dot11Radio0
Virtual-Dot11Radio0
   Protocols Configured:   Address:       Received: Transmitted:
        Bridging        Bridge Group 1    17        9
        Bridging        Bridge Group 1    17        9
Virtual LAN ID:  2 (IEEE 802.1Q Encapsulation)
   vLAN Trunk Interfaces:  Dot11Radio0.2
Virtual-Dot11Radio0.2
   Protocols Configured:   Address:       Received: Transmitted:
        Bridging        Bridge Group 2    1         0
        Bridging        Bridge Group 2    1         0
```

Trunking between VLANs



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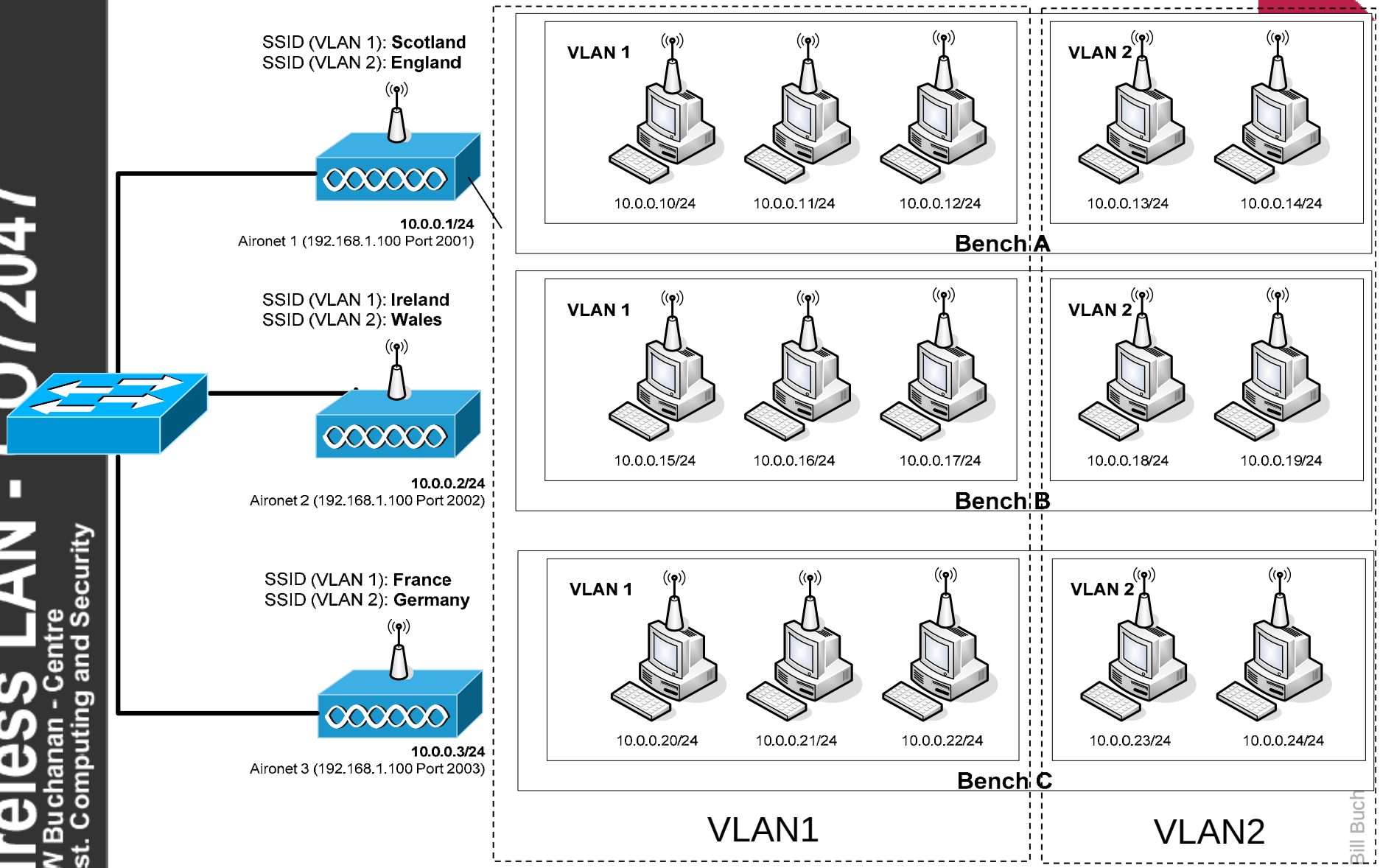

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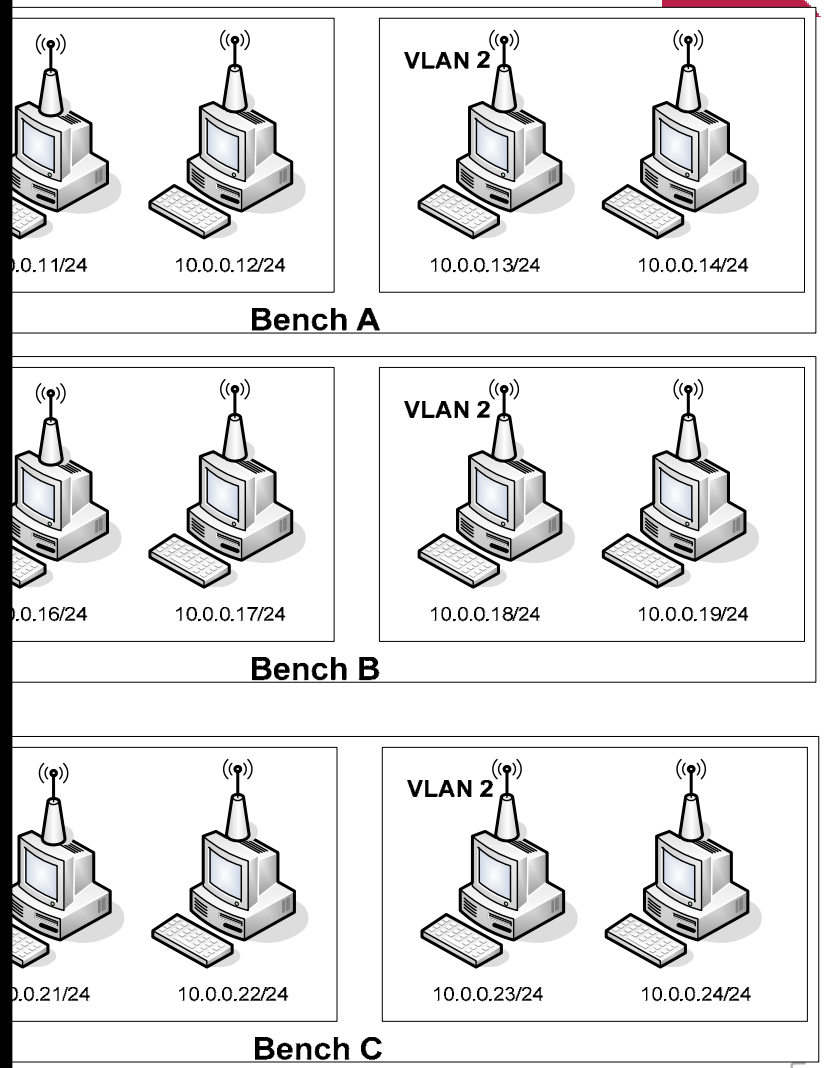
```
# config t
(config)# int vlan 1
(config-vlan)# exit
(config)# int vlan 2
(config-vlan)# exit
(config)# int fa0/1
(config-if)# switchport trunk encapsulation dot1q
(config-if)# switchport trunk native vlan 1
(config-if)# switchport trunk allowed vlan 1,2
(config-if)# switchport mode trunk
(config-if)# switchport nonegotiate
(config-if)# int fa0/2
(config-if)# switchport trunk encapsulation dot1q
(config-if)# switchport trunk native vlan 1
(config-if)# switchport trunk allowed vlan 1,2
(config-if)# switchport mode trunk
(config-if)# switchport nonegotiate
(config-if)# int fa0/3
(config-if)# switchport trunk encapsulation dot1q
(config-if)# switchport trunk native vlan 1
(config-if)# switchport trunk allowed vlan 1,2
(config-if)# switchport mode trunk
(config-if)# switchport nonegotiate
```

```
(config)# dot11 ssid Scotland
(config-ssid)# mbssid guest-mode
(config-ssid)# authentication open
(config-ssid)# vlan 1
(config-ssid)# exit
(config)# dot11 ssid England
(config-ssid)# mbssid guest-mode
(config-ssid)# authentication open
(config-ssid)# vlan 2
(config-ssid)# exit
(config)# int d0
(config-if)# mbssid
(config-if)# ssid Scotland
(config-if)# ssid England
(config-if)# channel 1
(config-if)# no shut
(config-if)# exit
(config)# int d0.1
(config-if)# encapsulation dot1q 1 native
(config-if)# int fa0.1
(config-if)# encapsulation dot1q 1 native
(config-if)# int d0.2
(config-if)# encapsulation dot1q 2
(config-if)# bridge-group 2
(config-if)# int fa0.2
(config-if)# encapsulation dot1q 2
(config-if)# bridge-group 2
```



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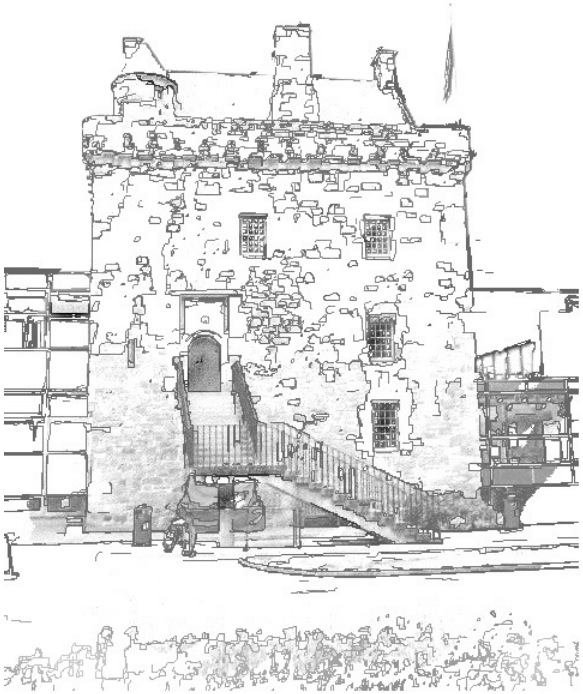
Routing between VLANs



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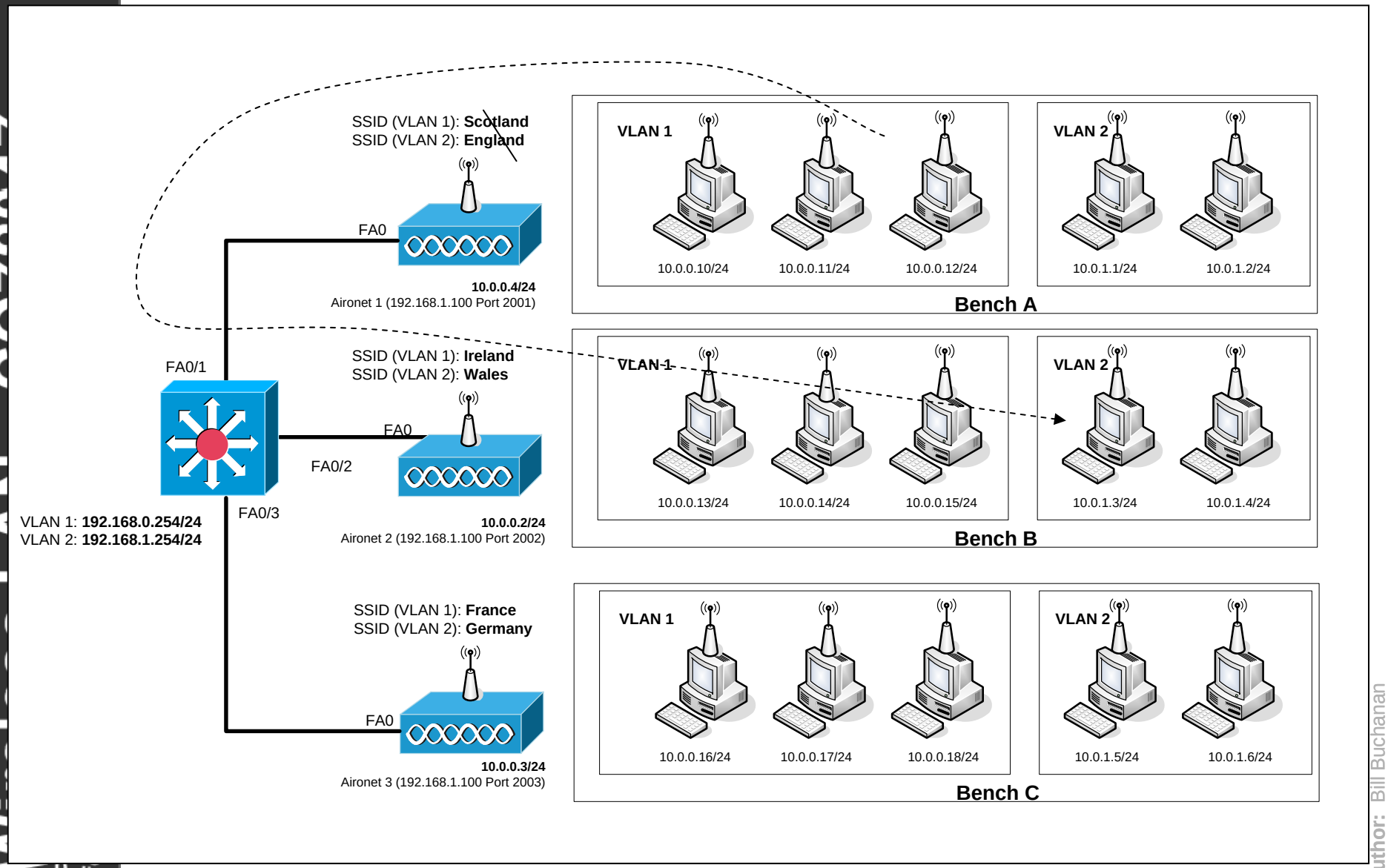
InterVLAN routing



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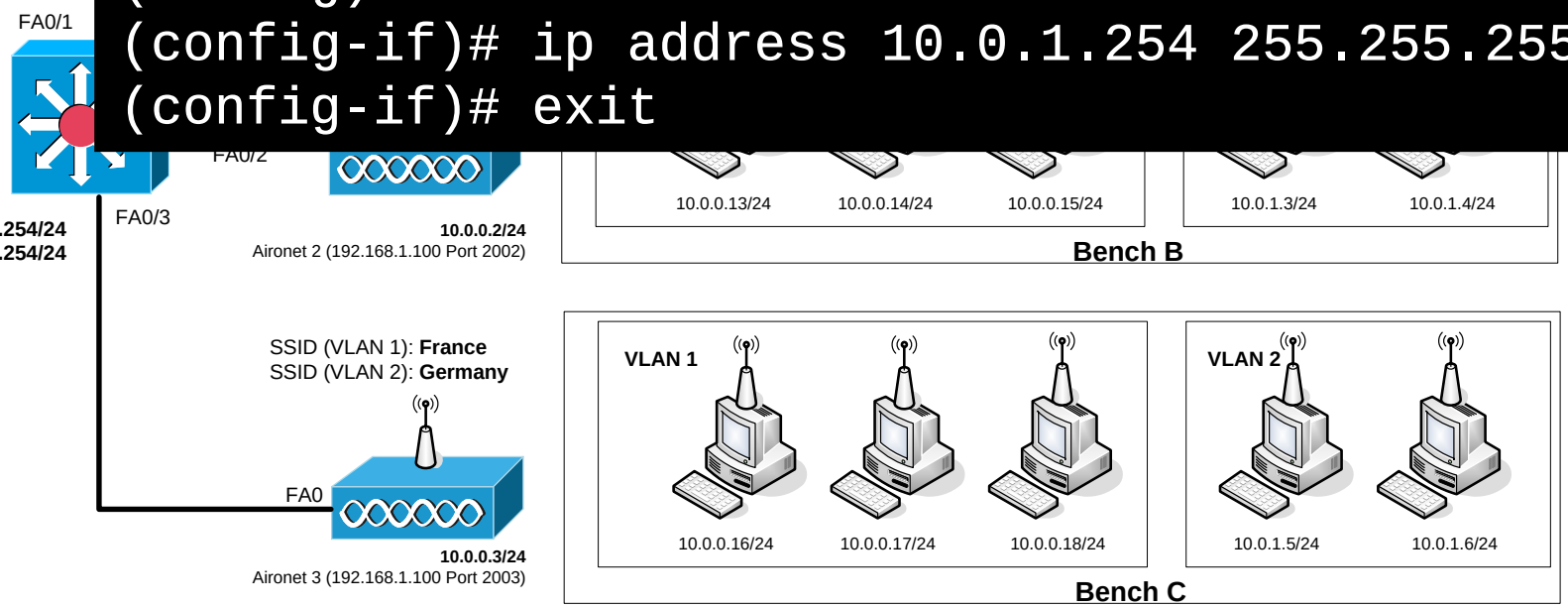
InterVLAN routing

```
config t
(config)# ip routing
(config)# vlan 1
(config-vlan)# exit
(config)# int vlan 1
(config)# ip address 10.0.0.254 255.255.255.0
(config-vlan)# exit
(config)# vlan 2
(config-vlan)# exit
(config)# int vlan 2
(config-if)# ip address 10.0.1.254 255.255.255.0
(config-if)# exit
```



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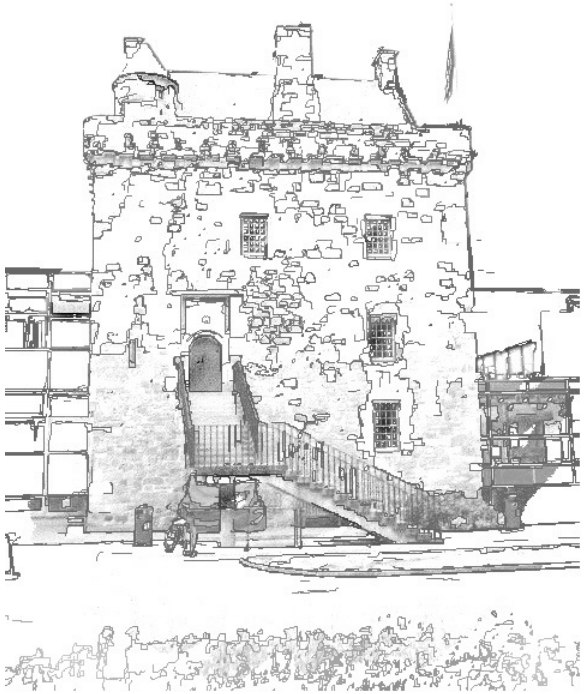
Applications



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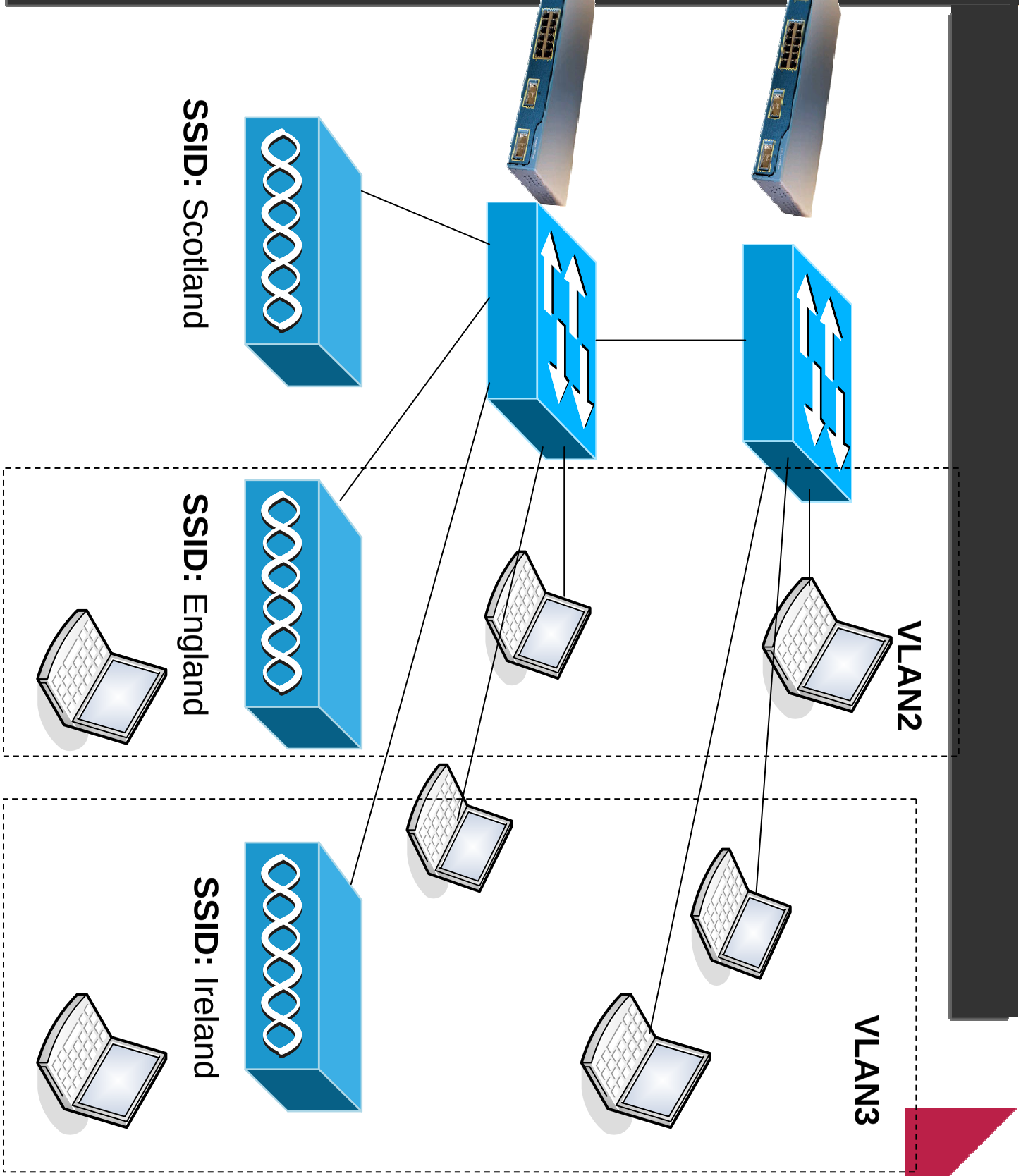

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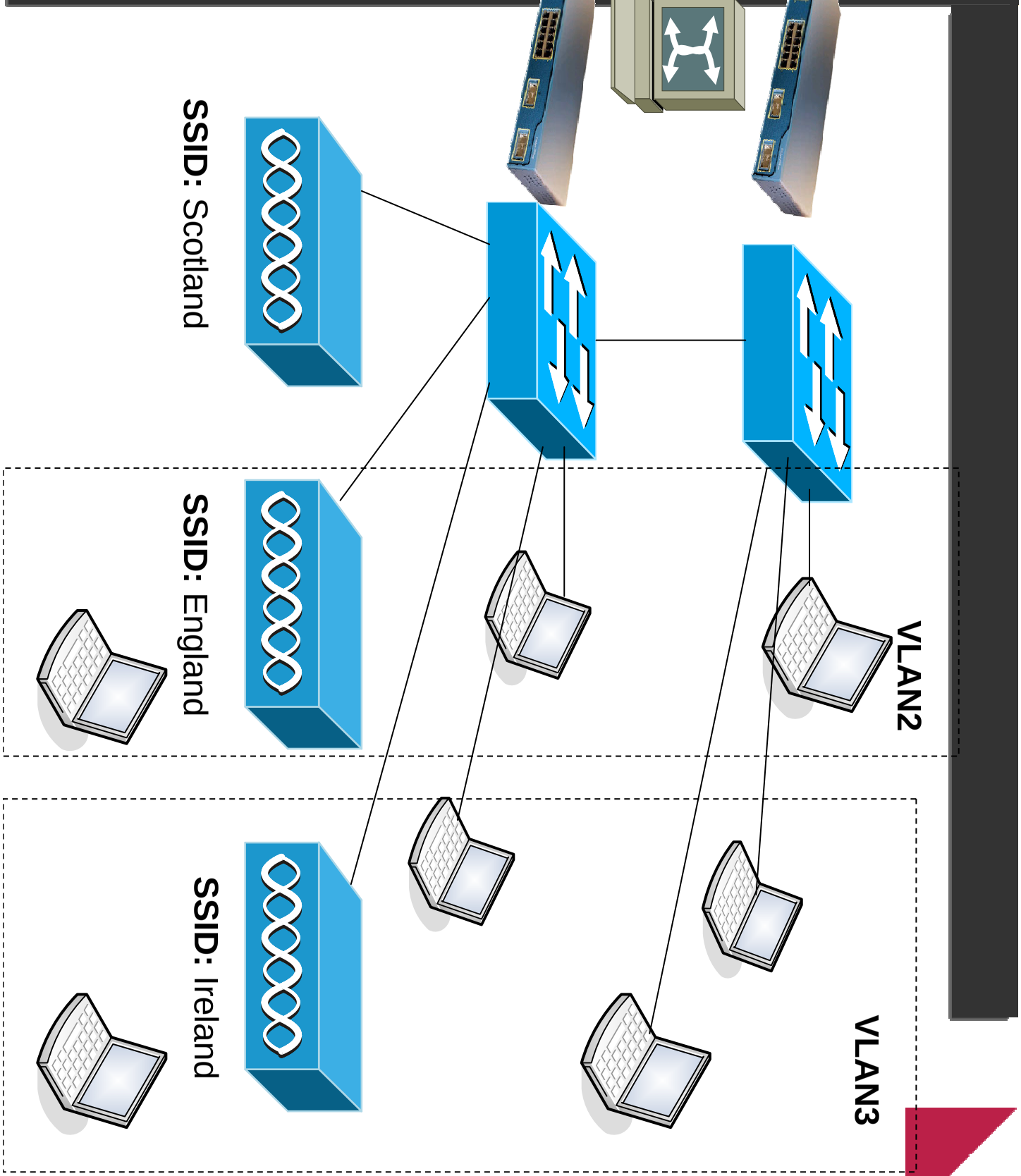

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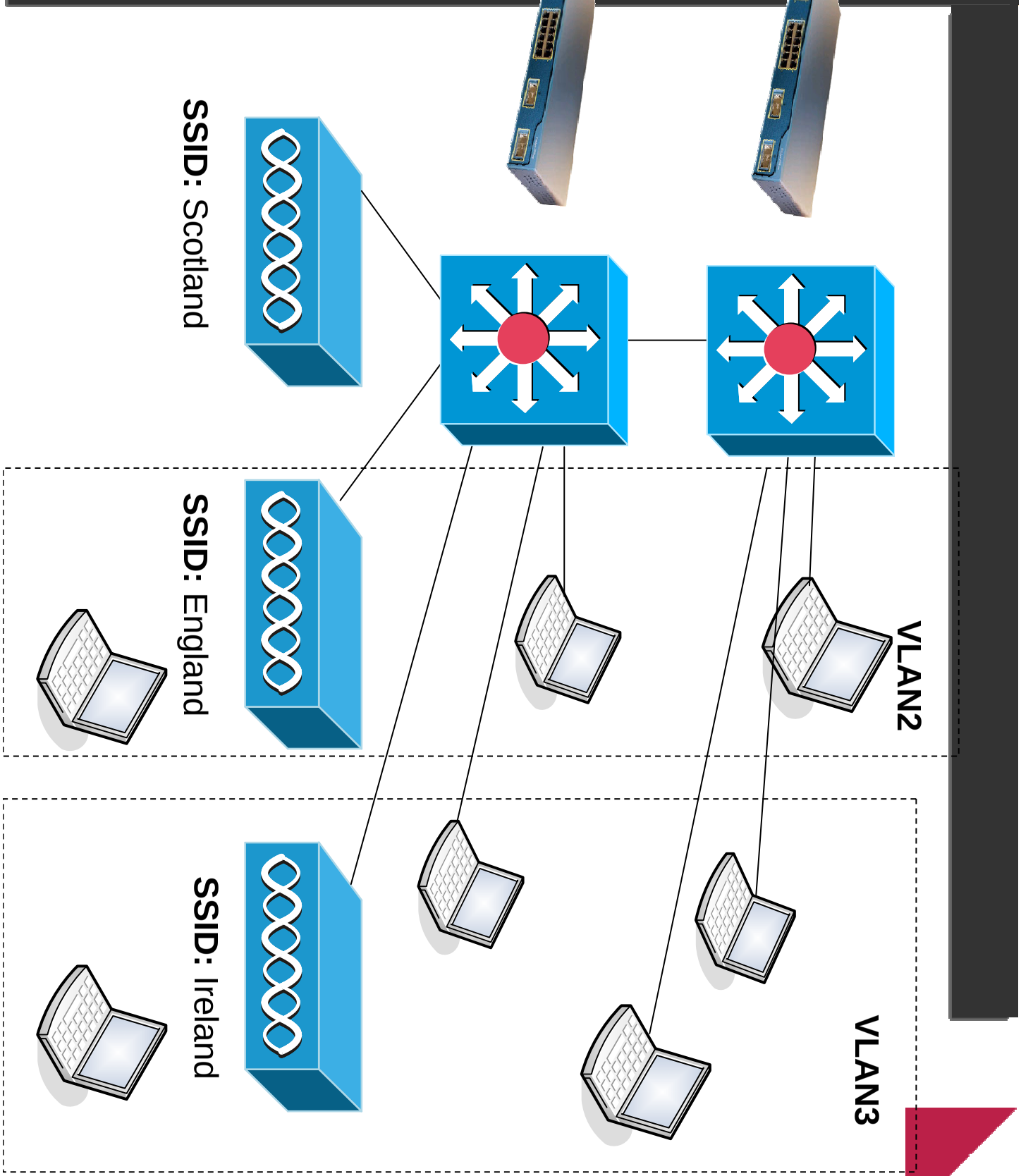

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