

Implementing ACI

Authored By:

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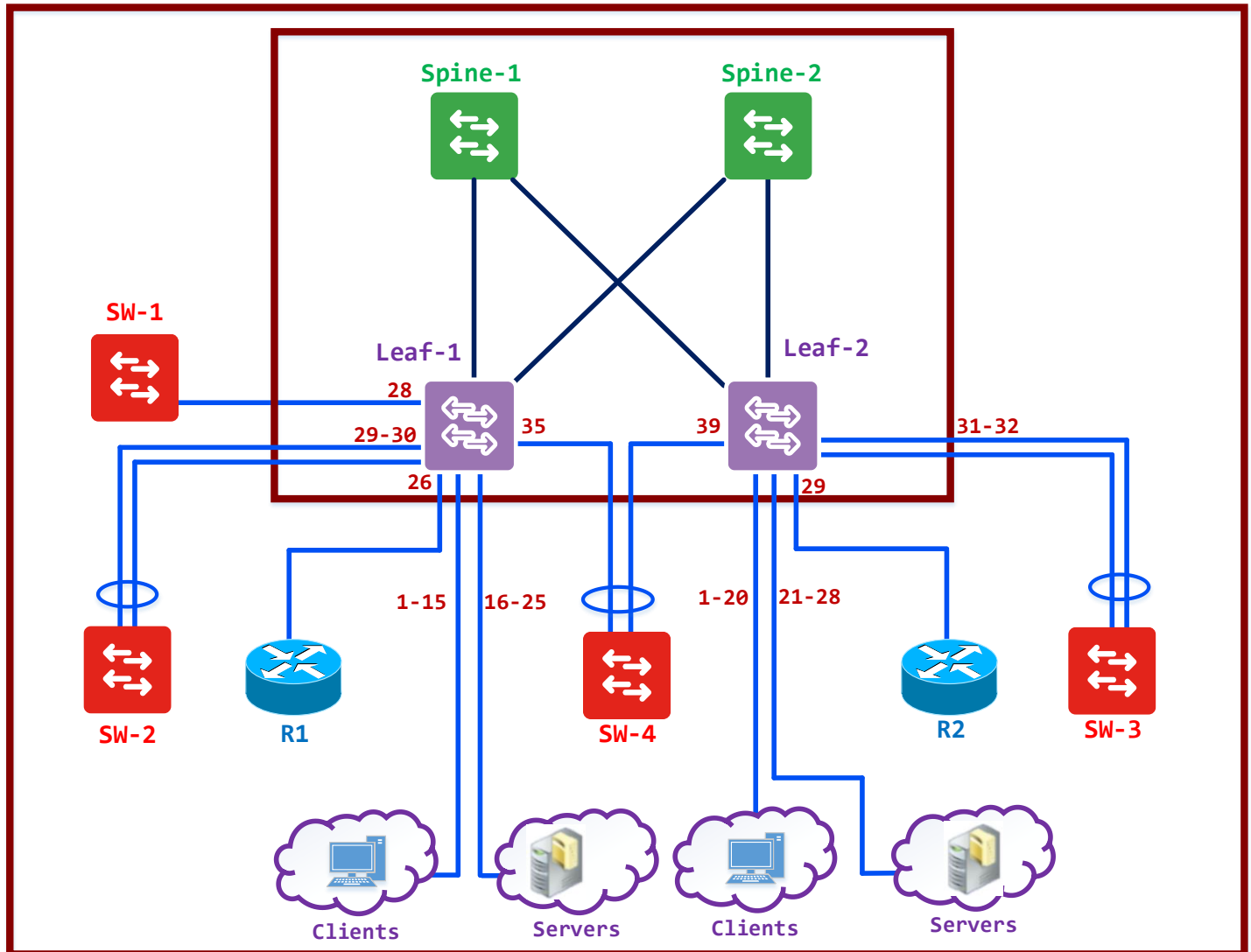
CCDE # 20110020

Fabric Discovery



Lab 1 – Fabric Discovery

Physical Topology



Fabric Discovery

- Discovery the Fabric and assign the Node Name and Node ID based on the following table:

Node Name	Node ID	POD#
LEAF-01	101	1
LEAF-02	102	1
SPINE-01	201	1
SPINE-02	202	1

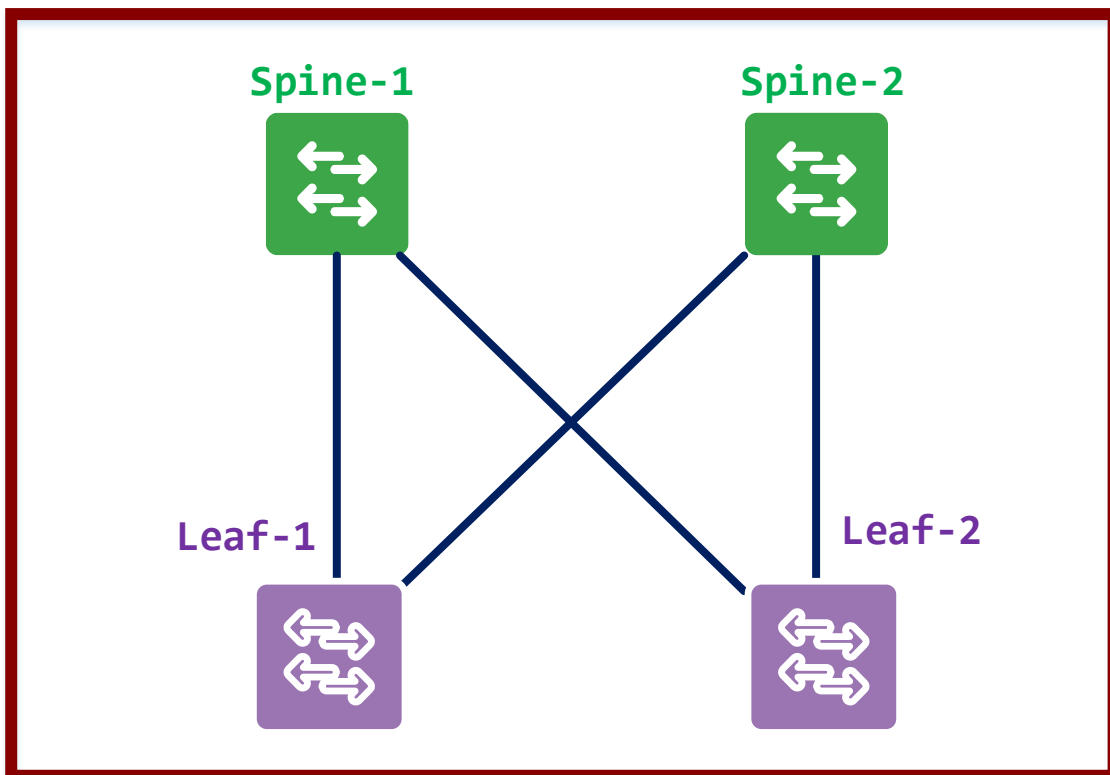
- Log into you APIC using the Username and Password provided.
- Click **Fabric -> Inventory -> Fabric Membership**
- You will see the first Leaf discovered.
- Right-click the Leaf and click **Register Switch**.
- Assign is parameters from the above table for LEAF-01.
- Click **Update**.
- The first Leaf will be registered. It will be assigned an IP Address from the Bootstrap Pool.
- It will discover the Spines. We have 2 Spines. They should show up in the Fabric Membership window.
- Right-click the first Spine switch and click **Register Switch**.
- Assign is parameters from the above table for SPINE-01.
- Click **Update**.
- Repeat the process for the second Spine switch. Assign it the parameters from the above table for SPINE-02.
- Click **Update**.
- It will discover the 2nd Leaf switch now.
- Right-click the second Leaf switch and click **Register Switch**.
- Assign is parameters from the above table for LEAF-02.

- Click **Update**.
- Your Fabric Membership should like the following diagram.

Fabric Membership

Serial Number	Pod ID	Node ID	Node Name	Rack Name	Model	Role	IP	Decomissioned	Supported Model	SSL Certificate
TEP-1-101	1	101	LEAF-01		N9K-C9396PX	leaf	10.0.56.95/32	False	True	yes
TEP-1-102	1	102	LEAF-02		N9K-C9396PX	leaf	10.0.80.94/32	False	True	n/a
TEP-1-103	1	201	SPINE-01		N9K-C9508	spine	10.0.56.94/32	False	True	yes
TEP-1-104	1	202	SPINE-02		N9K-C9508	spine	10.0.56.93/32	False	True	yes

- Notice the IP Address and Role.
- The role is automatically detected based on the Switch Model.
- This portion of your topology is configured now.



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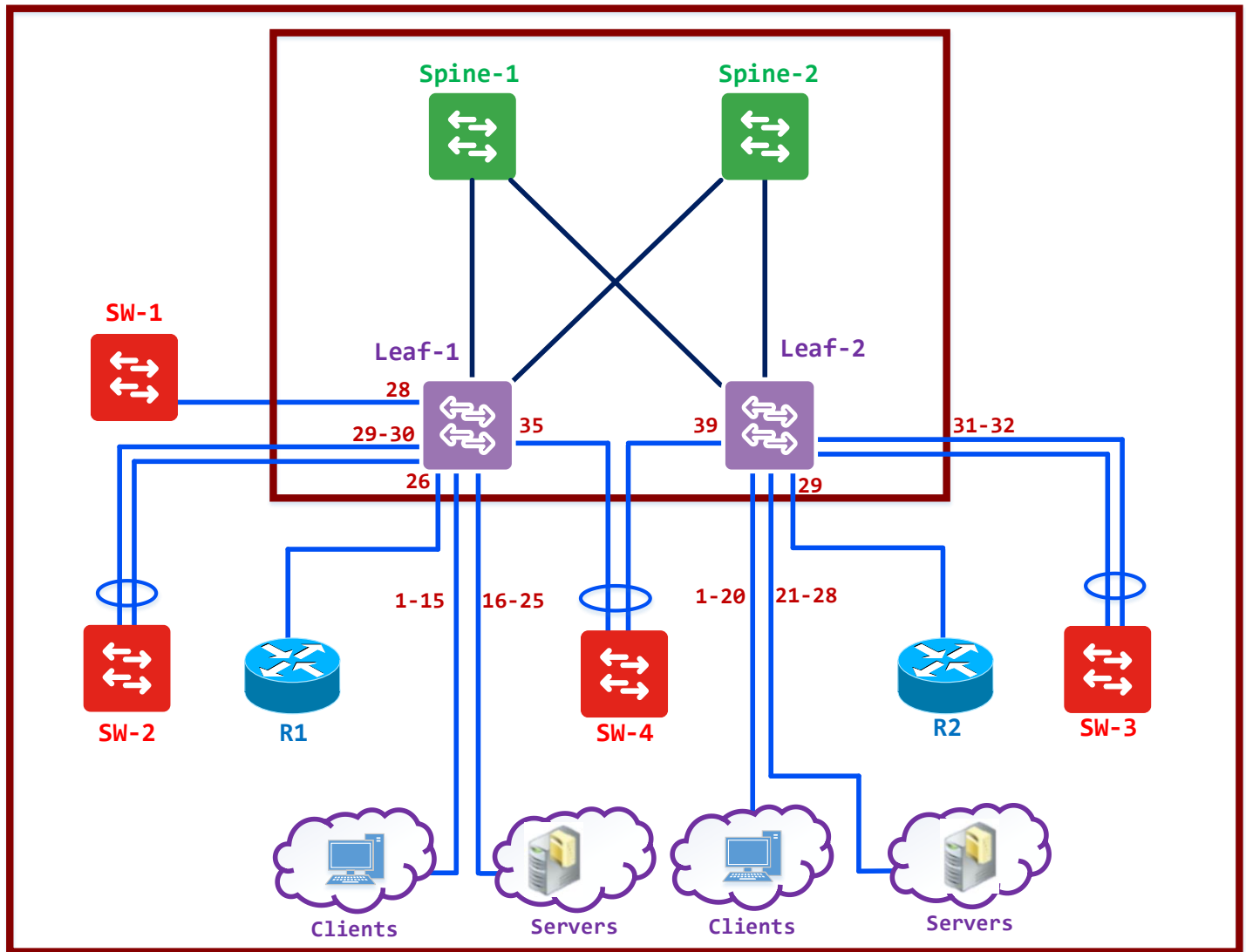
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Access Provisioning – Topology I



Lab 2 – Access Provisioning – Interface Policies

Physical Topology



Access Provisioning – Access Port Interface Policies

Note: The Access Provisioning labs are based on the Fabric Provisioning completed in Lab 1.

- You are planning on configuring the above topology for ACI. Besides the devices displayed above, the Servers & Clients will be connected to the following ports on the 2 Leaf switches.
 - **Clients**
 - LEAF-01 – Ports 1/1 – 15
 - LEAF-02 – Ports 1/1 – 20
 - **Servers**
 - LEAF-01 – Ports 1/16 – 25
 - LEAF-02 – Ports 1/21 – 28
- The port properties for the Devices will be based on the following table:

	Clients	Servers	Routers	Switches
CDP	Disabled	Disabled	Enabled	Enabled
LLDP	Disabled	Enabled	Disabled	Disabled
Port Security	1	5	1	
Storm Control	50%	60%		60%
Speed	1G	10G	10G	40G
STP	Enabled	Enabled	Enabled	

- Configure all the Policies defined in the table above.

Task 1 – Configure the Interface Policies – CDP

- Click **Fabric -> Access Policies -> Interface Policies -> Policies -> CDP Policies**
- Configure CDP Policies based on the following:
 - **Policy # 1**
 - Name: **CDP-ON**
 - Admin-State: **Enabled**
 - **Policy # 2**
 - Name: **CDP-OFF**
 - Admin-State: **Disabled**

Task 2 – Configure the Interface Policies – LLDP

- Click **Fabric -> Access Policies -> Interface Policies -> Policies -> LLDP Policies**
- Configure LLDP Policies based on the following:
 - **Policy # 1**
 - Name: **LLDP-ON**
 - Transmit – **Enabled**
 - Receive – **Enabled**
 - **Policy # 2**
 - Name: **LLDP-OFF**
 - Transmit – **Disabled**
 - Receive – **Disabled**

Task 3 – Configure the Interface Policies – Link Level

- Click **Fabric -> Access Policies -> Interface Policies -> Policies -> Link Level**
- Configure Link Level Policies based on the following:
 - **Policy # 1**
 - Name: **1G-AUTO**
 - Speed – **1 gbps**
 - **Policy # 2**
 - Name: **10G-AUTO**
 - Speed – **10 gbps**
 - **Policy # 3**
 - Name: **40G-AUTO**
 - Speed – **40 gbps**

Task 4 – Configure the Interface Policies –Port Security

- Click **Fabric -> Access Policies -> Interface Policies -> Policies -> Port Security**
- Configure Port-Security Policies based on the following:
 - **Policy # 1**
 - Name: **PS-1**
 - Parameters: **Maximum EndPoints – 1**
 - **Policy # 2**
 - Name: **PS-5**
 - Parameters: **Maximum EndPoints – 5**

Task 5 – Configure the Interface Policies – Storm Control

- Click **Fabric -> Access Policies -> Interface Policies -> Policies -> Storm Control**
- Configure Storm Control Policies based on the following:
 - **Policy # 1**
 - Name: **SC-50**
 - Percentages: **50**
 - **Policy # 2**
 - Name: **SC-60**
 - Percentages: **60**

Task 6 – Configure the Interface Policies – Storm Control

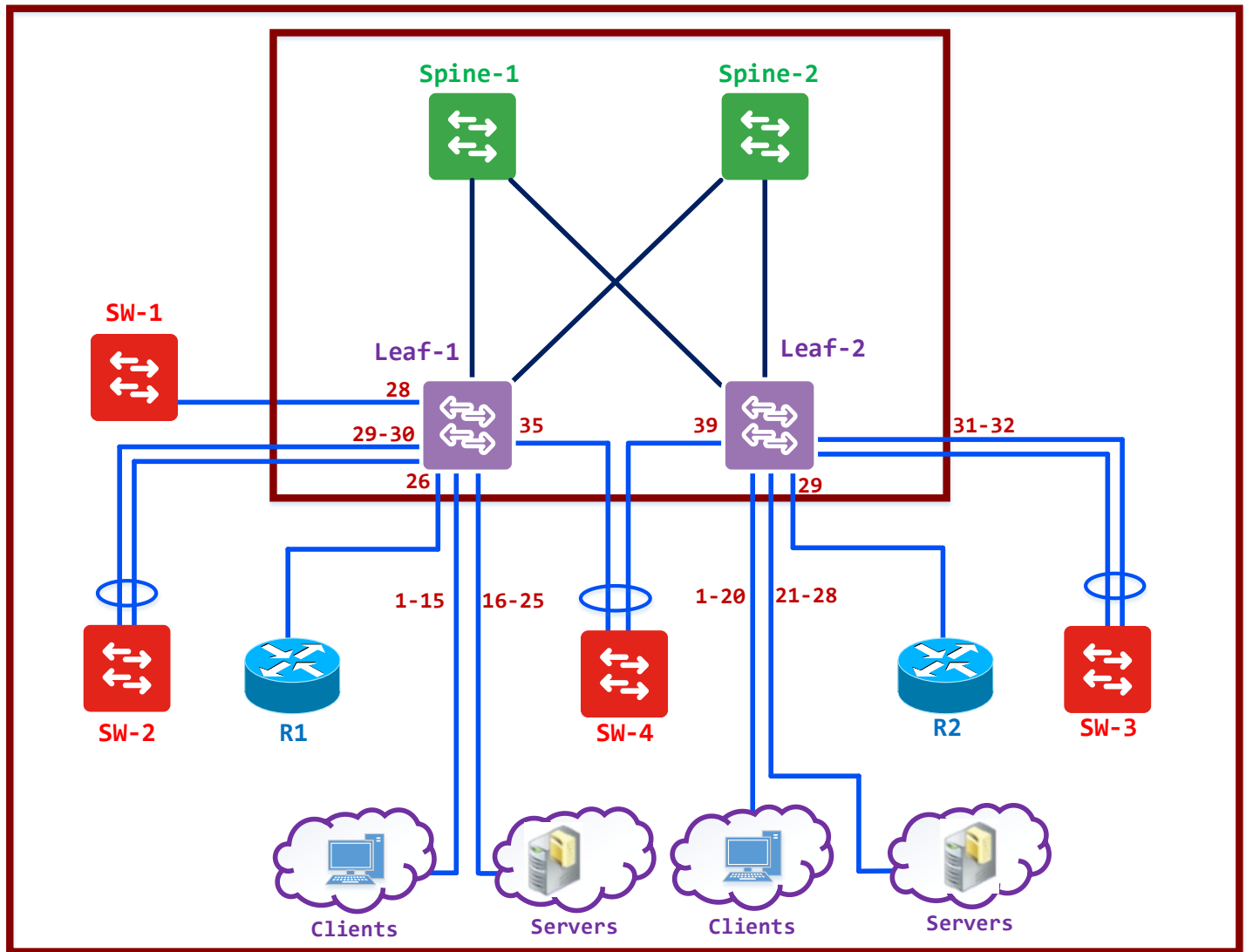
- Click **Fabric -> Access Policies -> Interface Policies -> Policies -> Storm Control**
- Configure Storm Control Policies based on the following:
 - **Policy # 1**
 - Name: **SC-50**
 - Percentages: **50**
 - **Policy # 2**
 - Name: **SC-60**
 - Percentages: **60**

Task 7 – Configure the Interface Policies – BPDU Guard

- Click **Fabric -> Access Policies -> Interface Policies -> Policies -> Spanning Tree**
- Configure Spanning Tree Policies based on the following:
 - **Policy # 1**
 - Name: **STP-BPDUGUARD**
 - BPDU Guard: **Enabled**

Lab 3 – Access Provisioning – Leaf Access Port IPGs

Physical Topology



Access Provisioning – Leaf Access Port IPGs

- Configure the IPGs for Clients, Servers & Routers based on the table below. Switch IPG's will be created later.

	Clients	Servers	Routers	Switches
CDP	Disabled	Disabled	Enabled	Enabled
LLDP	Disabled	Enabled	Disabled	Disabled
Port Security	1	5	1	
Storm Control	50%	60%		60%
Speed	1G	10G	10G	40G
STP	Enabled	Enabled	Enabled	

Task 1 – Configure the Interface Policy Groups – Clients

- Click **Fabric -> Access Policies -> Interface Policies -> Policy Groups -> Leaf-Access-Port**
- Configure Client IPGs based on the following:
 - Name: **IPG-CLIENTS**
 - CDP: **CDP-OFF**
 - LLDP: **LLDP-OFF**
 - Port Security: **PS-1**
 - Storm Control: **SC-50**
 - Link Level: **1G-AUTO**
 - Spanning Tree: **STP-BPDUGUARD**

Task 2 – Configure the Interface Policy Groups – Servers

- Click **Fabric -> Access Policies -> Interface Policies -> Policy Groups -> Leaf-Access-Port**
- Configure Client IPGs based on the following:
 - Name: **IPG-SERVERS**
 - CDP: **CDP-OFF**
 - LLDP: **LLDP-ON**
 - Port Security: **PS-5**
 - Storm Control: **SC-60**
 - Link Level: **10G-AUTO**
 - Spanning Tree: **STP-BPDUGUARD**

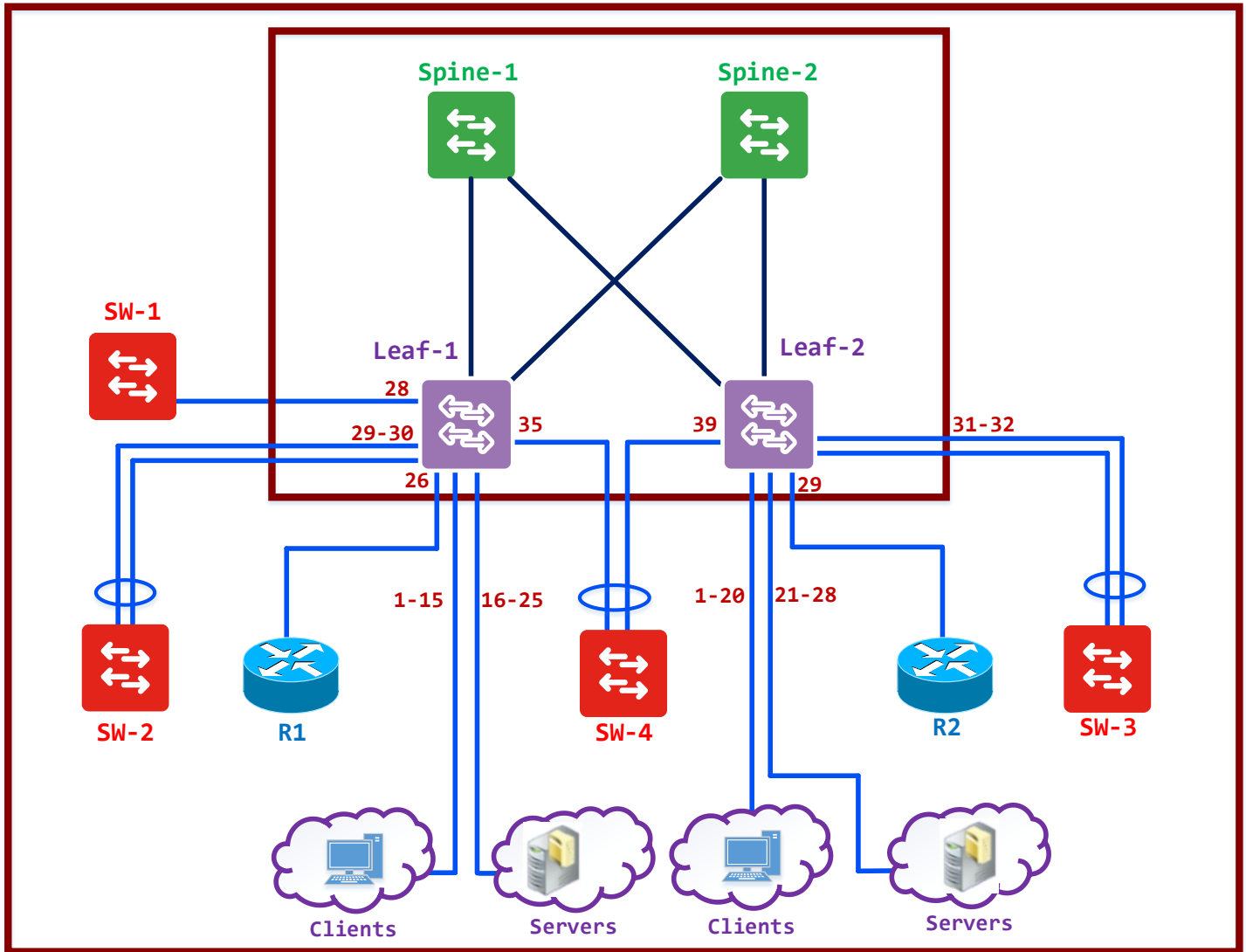
Task 3 – Configure the Interface Policy Groups – Routers

- Click **Fabric -> Access Policies -> Interface Policies -> Policy Groups -> Leaf-Access-Port**

- Configure Client IPGs based on the following:
 - Name: **IPG-ROUTERS**
 - CDP: **CDP-ON**
 - LLDP: **LLDP-OFF**
 - Port Security: **PS-1**
 - Link Level: **10G-AUTO**
 - Spanning Tree: **STP-BPDUGUARD**

Lab 4 – Access Provisioning – Switch IPGs

Physical Topology



Access Provisioning – Port Channel IPGs

- Configure the IPGs for SW1, SW2 & SW3 based on the table below. Use LACP Active for the Port-Channel Protocol. SW4 IPG will be created later.

	Clients	Servers	Routers	Switches
CDP	Disabled	Disabled	Enabled	Enabled
LLDP	Disabled	Enabled	Disabled	Disabled
Port Security	1	5	1	
Storm Control	50%	60%		60%
Speed	1G	10G	10G	40G
STP	Enabled	Enabled	Enabled	

Task 1 – Configure the Interface Policies – Port-Channel

- Click **Fabric -> Access Policies -> Interface Policies -> Policies -> Port-Channel**
- Configure Port-Channel Policy based on the following:
 - **Policy # 1**
 - Name: **LACP-Active**
 - Mode: **Active**

Task 2 – Configure the Interface Policy Groups – SW1

- Click **Fabric -> Access Policies -> Interface Policies -> Policy Groups -> Leaf-Access-Port**
- Configure Client IPGs based on the following:
 - Name: **IPG-SW1**
 - CDP: **CDP-OFF**
 - LLDP: **LLDP-ON**
 - Storm Control: **SC-60**
 - Link Level: **40G-AUTO**

Task 3 – Configure the Interface Policy Groups – SW2

- Click **Fabric -> Access Policies -> Interface Policies -> Policy Groups -> PC Policy Group**

- Configure Client IPGs based on the following:
 - Name: **IPG-SW2-PC**
 - CDP: **CDP-OFF**
 - LLDP: **LLDP-ON**
 - Storm Control: **SC-60**
 - Link Level: **40G-AUTO**
 - Port Channel: **LACP-Active**

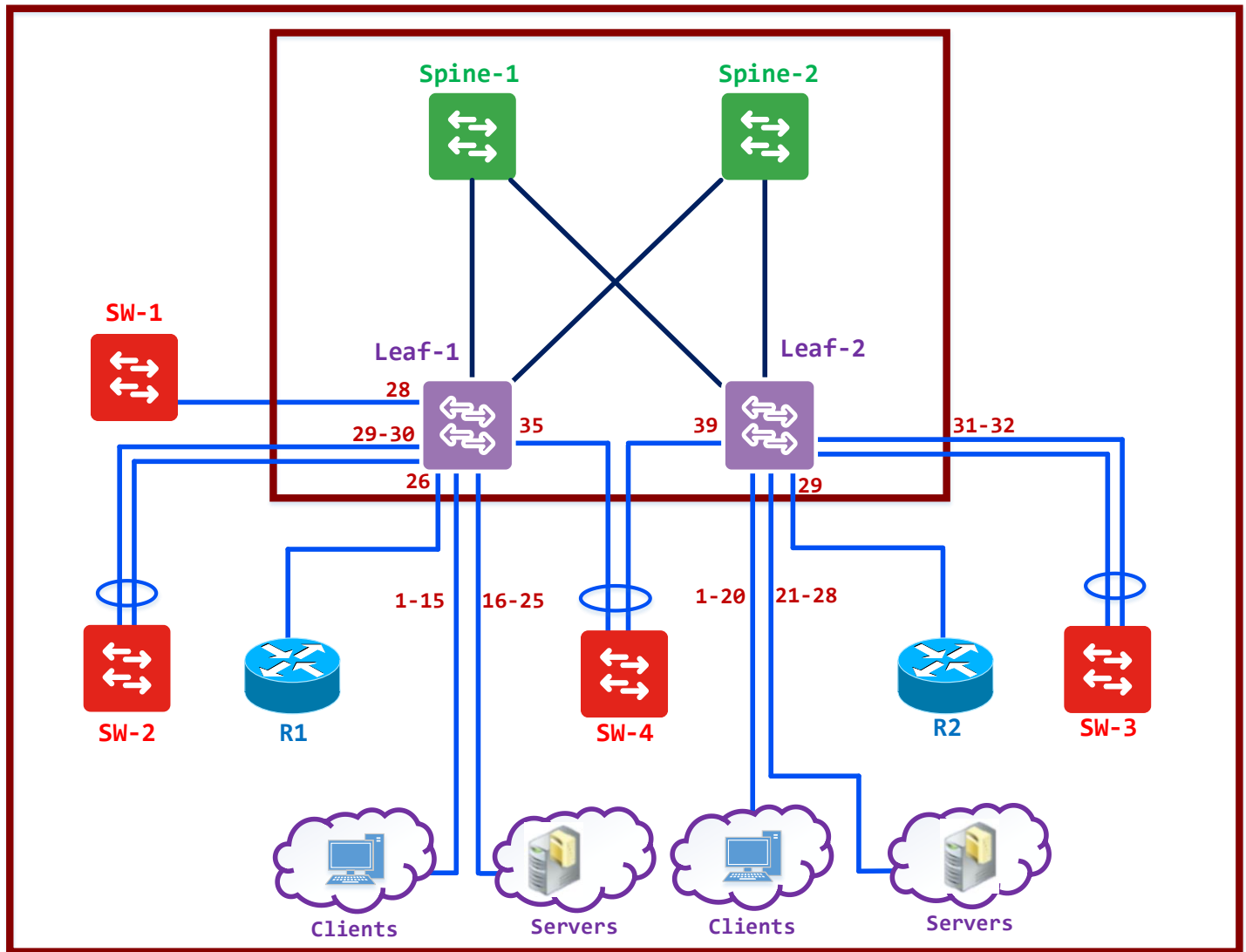
Task 4 – Configure the Interface Policy Groups – SW3

- Click **Fabric -> Access Policies -> Interface Policies -> Policy Groups -> PC Policy Group**

- Configure Client IPGs based on the following:
 - Name: **IPG-SW3-PC**
 - CDP: **CDP-OFF**
 - LLDP: **LLDP-ON**
 - Storm Control: **SC-60**
 - Link Level: **40G-AUTO**
 - Port Channel: **LACP-Active**

Lab 5 – Access Provisioning – Configuring vPC Domain

Physical Topology



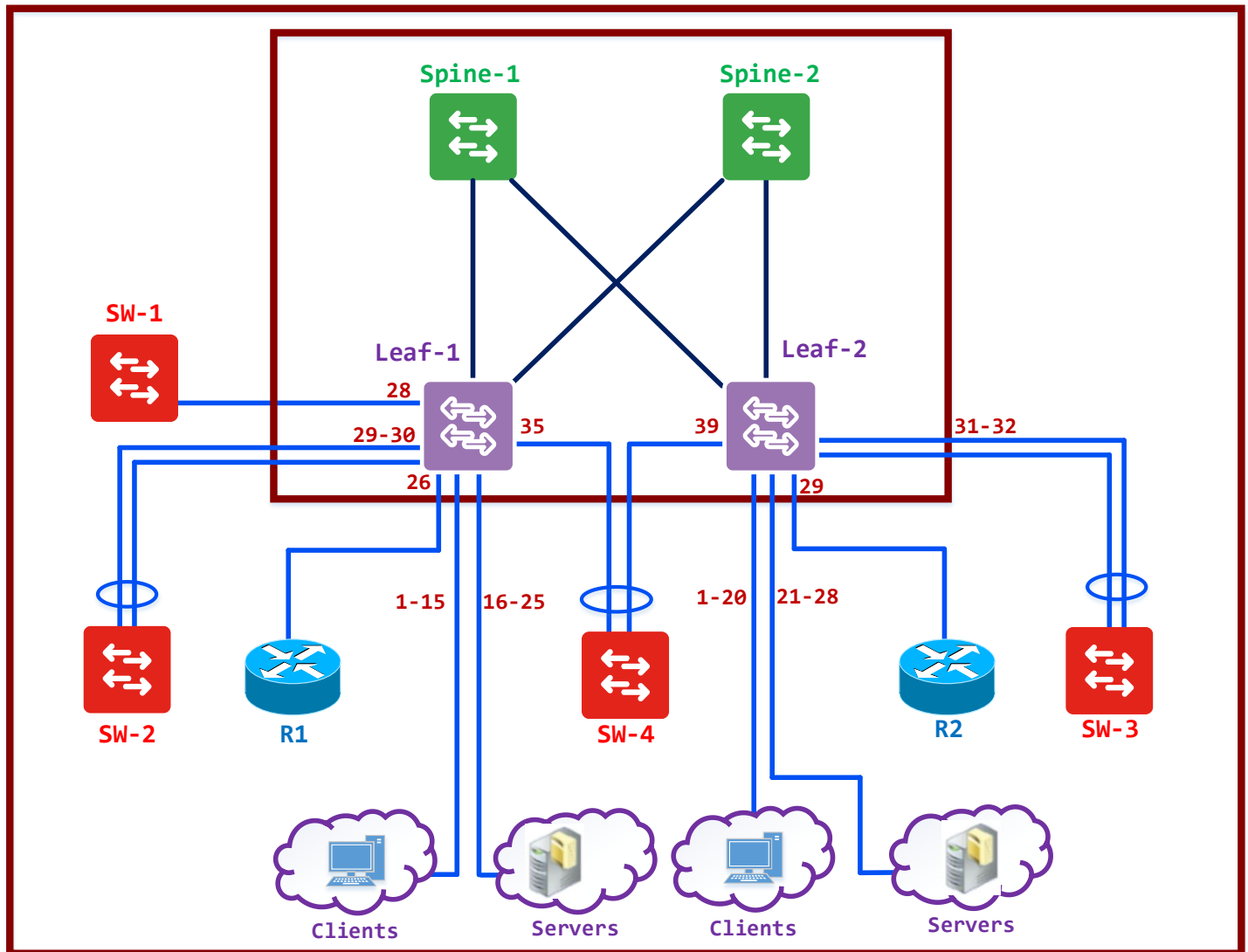
Access Provisioning – vPC

Task 1 – Configure a vPC Domain between Leaf-01 & Leaf-02

- Click **Fabric -> Access Policies -> Switch Policies -> Policies -> Virtual Port Channel Default**
- Configure a vPC between Leaf-01 & Leaf-02. Use the following parameters:
 - Name: **vPC-LEAF-01-02**
 - Domain ID: **12**
 - VPC Domain Policy: **Default**
 - Switch 1: **101**
 - Switch 2: **102**

Lab 6 – Access Provisioning – vPC IPG

Physical Topology



Access Provisioning – Virtual Port Channel IPGs

- Configure a IPG for a SW4 based on the table below. Use LACP Active for the Port-Channel Protocol.

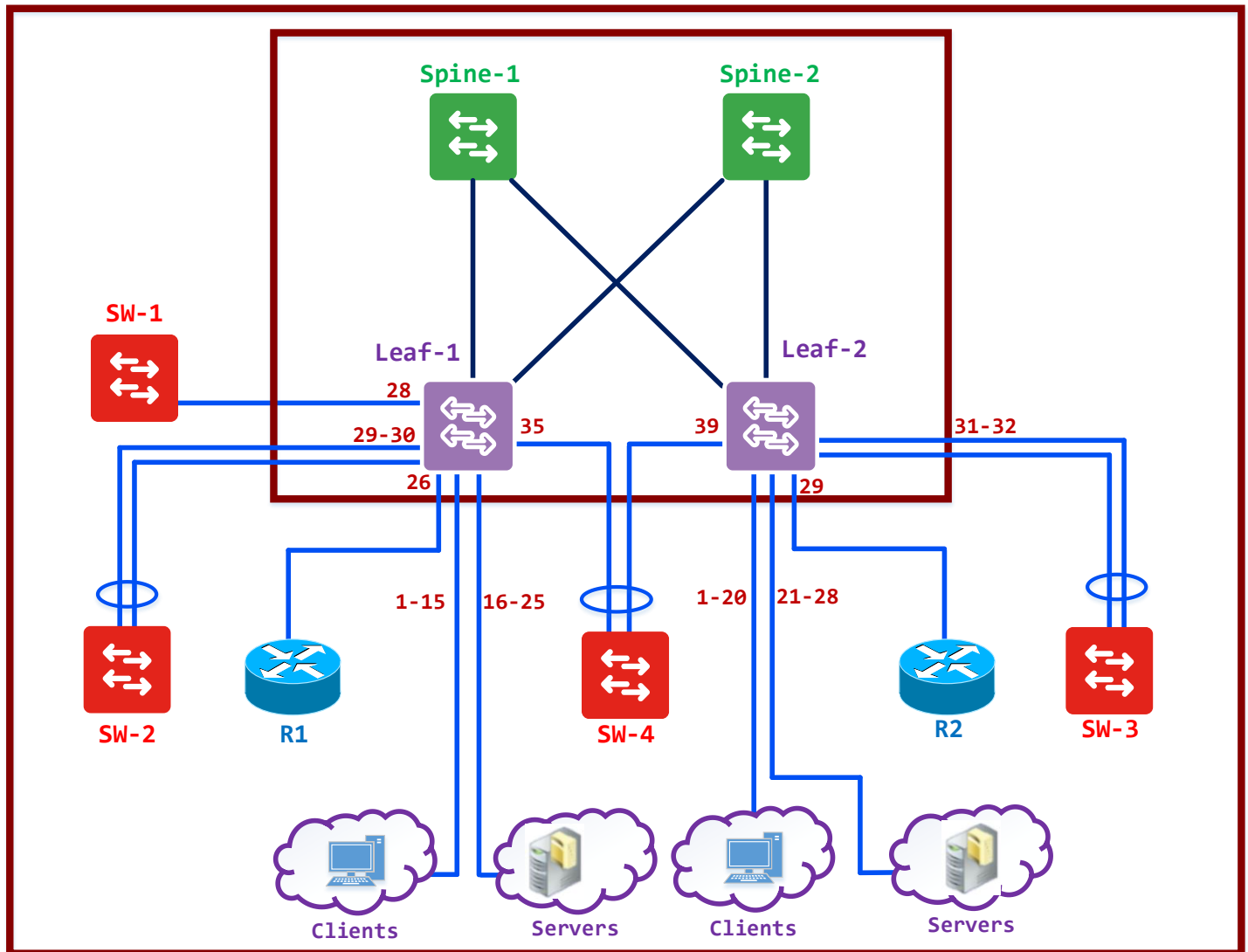
	Clients	Servers	Routers	Switches
CDP	Disabled	Disabled	Enabled	Enabled
LLDP	Disabled	Enabled	Disabled	Disabled
Port Security	1	5	1	
Storm Control	50%	60%		60%
Speed	1G	10G	10G	40G
STP	Enabled	Enabled	Enabled	

Task 2 – Configure the Interface Policy Groups – SW4

- Click **Fabric -> Access Policies -> Interface Policies -> Policy Groups -> vPC Policy Group**
- Configure Client IPGs based on the following:
 - Name: **IPG-SW4-vPC**
 - CDP: **CDP-OFF**
 - LLDP: **LLDP-ON**
 - Storm Control: **SC-60**
 - Link Level: **40G-AUTO**
 - Port Channel: **LACP-Active**

Lab 7 – Access Provisioning – Interface Profile

Physical Topology



Access Provisioning – Leaf Interface Profile

- You are planning on configuring the above topology for ACI. Besides the devices displayed above, the Servers & Clients will be connected to the following ports on the 2 Leaf switches.

Task 1 – Configure Interface Profiles

- Click **Fabric -> Access Policies -> Interface Policies -> Policy Groups -> vPC Policy Group**
- Configure an Interface Profiles based on the following:

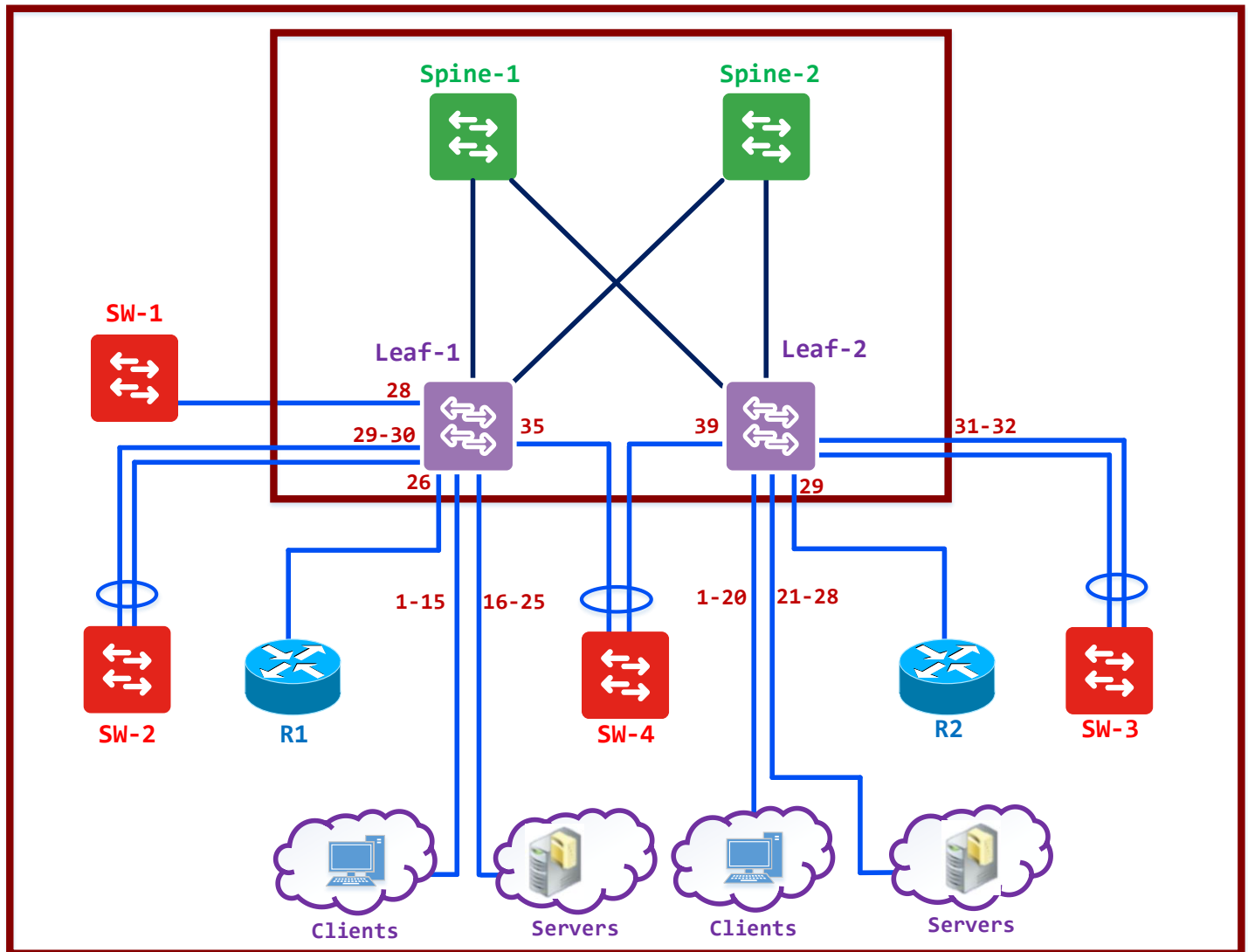
Interface Profile: INT-PROF-1		
Interface Names	Ports	IPGs
E1-15-CLIENTS	1/1-15	IPG-CLIENTS
E16-25-SERVERS	1/16-25	IPG-SERVERS
E26-27-ROUTERS	1/26-27	IPG-ROUTERS
E28-SW1	1/28	IPG-SW1
E29-30-SW2-PC	1/29-30	IPG-SW2-PC
E35-SW4-vPC	1/35	IPG-SW4-vPC

- Configure an Interface Profiles based on the following:

Interface Profile: INT-PROF-2		
Interface Names	Ports	IPGs
E1-20-CLIENTS	1/1-20	IPG-CLIENTS
E21-28-SERVERS	1/21-28	IPG-SERVERS
E29-30-ROUTERS	1/29-30	IPG-ROUTERS
E31-32-SW3-PC	1/31-32	IPG-SW3-PC
E39-SW4-vPC	1/39	IPG-SW4-vPC

Lab 8 – Access Provisioning – Switch Profile

Physical Topology



Access Provisioning – Leaf Switch Profile

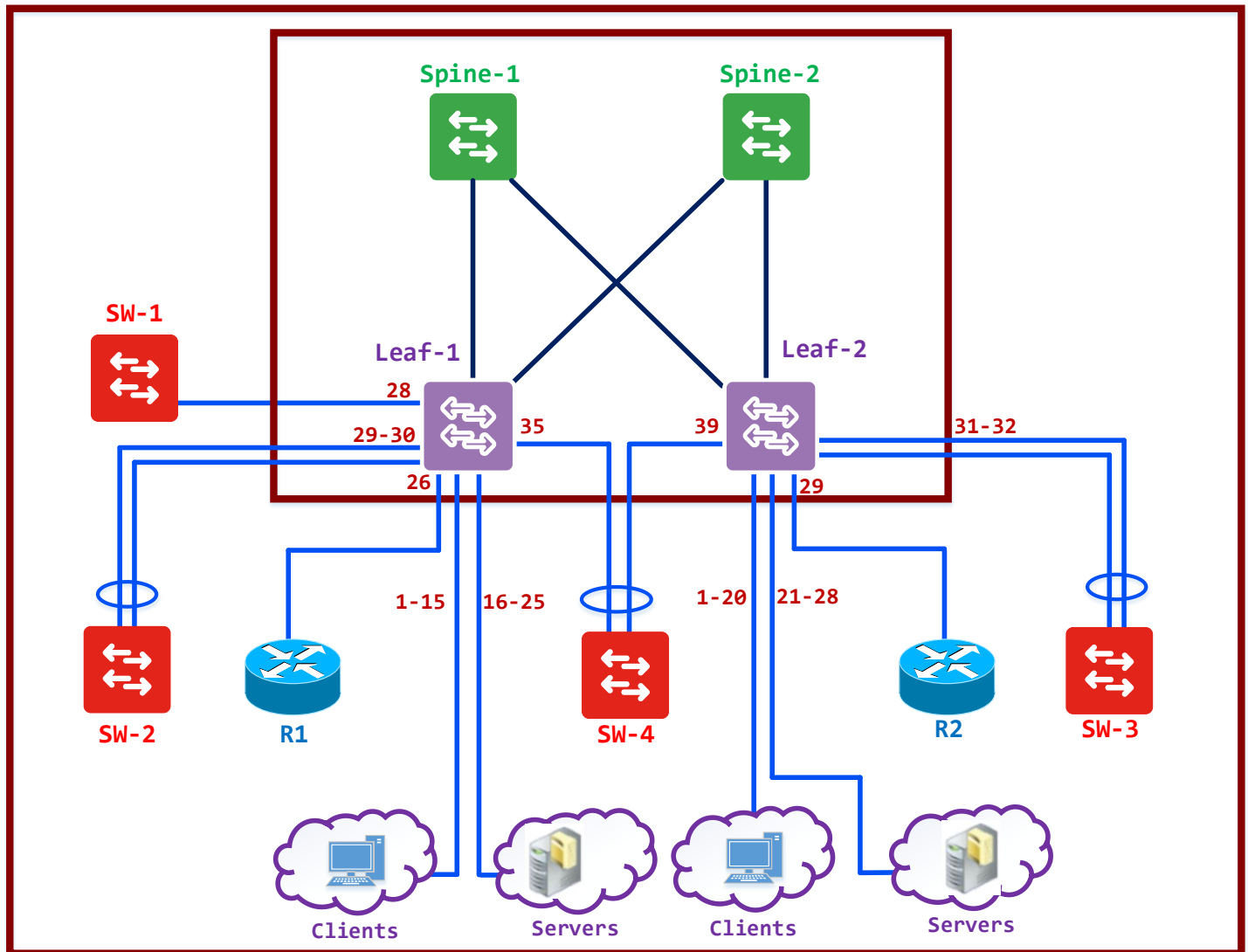
- Assign the Interface Profiles created in the previous labs to the appropriate Leaf Switches.

Task 1 – Configure Switch Profiles

- Click **Fabric -> Access Policies -> Switch Policies -> Profiles**
- Configure a Switch Profile based on the following:
 - Name: **SW-PROF-1**
 - Leaf Name: **LEAF-01**
 - Leaf Node ID: **101**
 - Interface profile: **INT-PROF-1**
- Configure a Switch Profile based on the following:
 - Name: **SW-PROF-2**
 - Leaf Name: **LEAF-02**
 - Leaf Node ID: **102**
 - Interface profile: **INT-PROF-2**

Lab 9 – Access Provisioning – VLAN Pools

Physical Topology



Access Provisioning – VLAN Pool

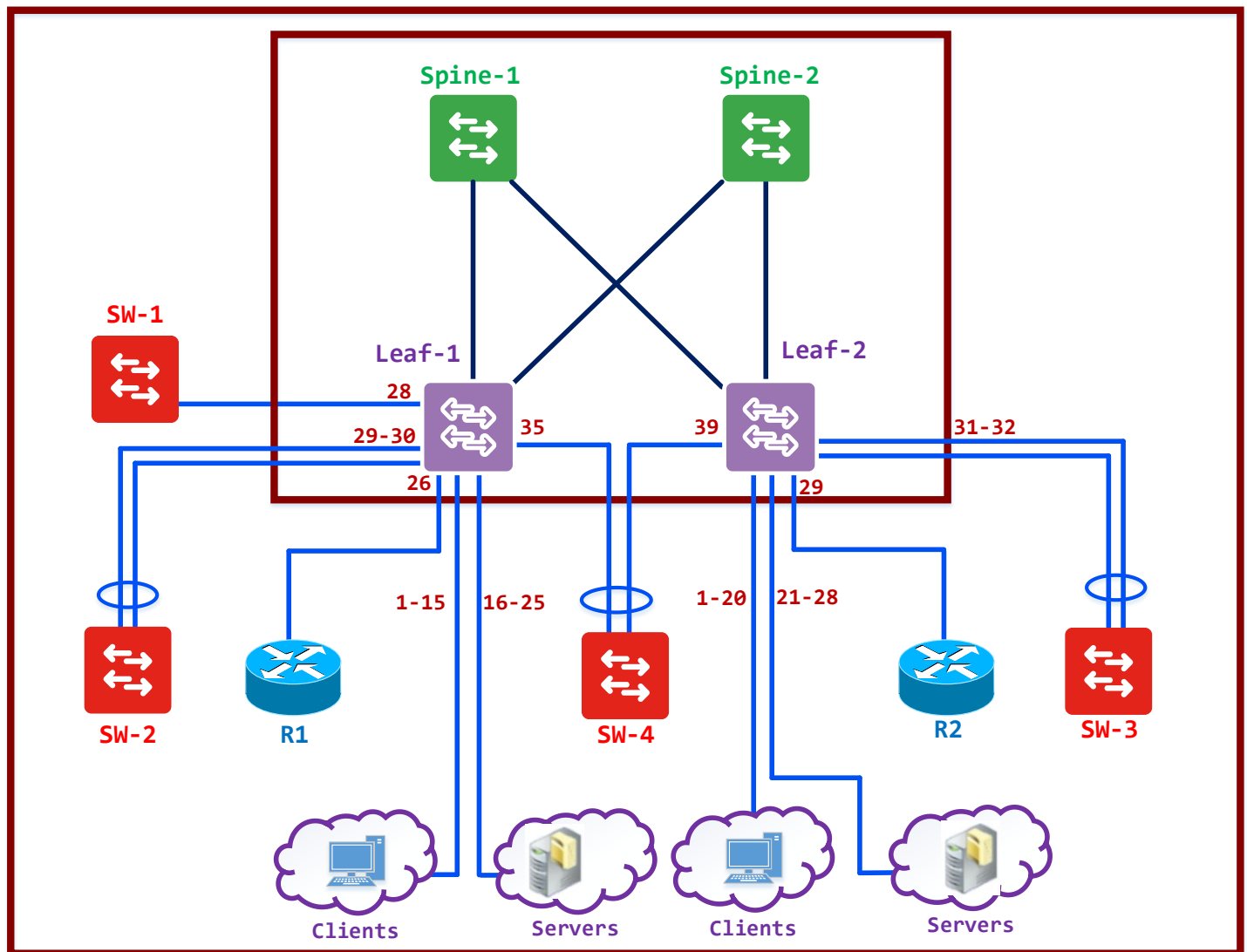
- Create a VLAN Pool to be assigned to the Domain

Task 1 – Configure VLAN Pool

- Click **Fabric -> Access Policies -> Pools -> VLANS**
- Create a Pool of VLANs that will be used within ACI for Physical ACI Ports:
 - Name: **VLAN-POOL-ACI**
 - Leaf Name: **Static Allocation**
 - Range: **1-500**
- Create a Pool of VLANs that will be used within ACI for External Bridged Ports ACI Ports:
 - Name: **VLAN-POOL-L2**
 - Leaf Name: **Static Allocation**
 - Range: **400-500**
- Create a Pool of VLANs that will be used within ACI for External Routed Ports ACI Ports:
 - Name: **VLAN-POOL-L3**
 - Leaf Name: **Static Allocation**
 - Range: **1-400**

Lab 10 – Access Provisioning – Domains

Physical Topology



Access Provisioning – Domains

- Create Domains to specify port types.

Task 1 – Configure a Physical Domain (Physical ACI Ports)

- Click **Fabric -> Access Policies -> Physical and External Domains -> Physical Domains**
- Create a Physical Domain and link it to the VLAN Pool based on the following:
 - Name: **ACI-PORTS**
 - VLAN Pool: **VLAN-POOL-ACI**

Task 2 – Configure an External L2 Domain (Connecting to Non-ACI Switches for L2OUT)

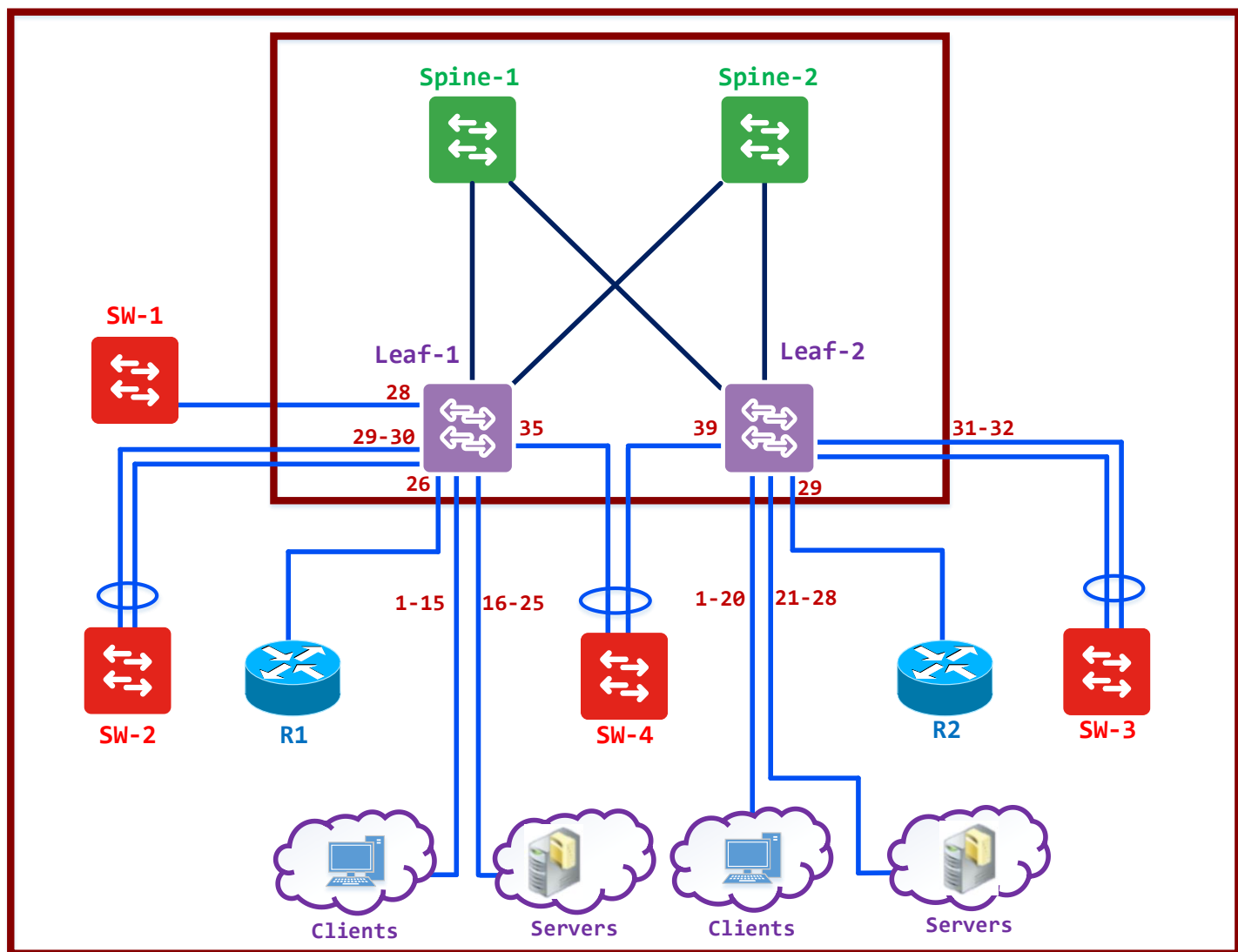
- Click **Fabric -> Access Policies -> Physical and External Domains -> External Bridged Domain**
- Create an External Brige Domain and link it to the VLAN Pool based on the following:
 - Name: **EXT-L2-PORTS**
 - VLAN Pool: **VLAN-POOL-L2**

Task 3 – Configure an External L3 Domain (Connecting to Non-ACI L3 Devices for L3OUT)

- Click **Fabric -> Access Policies -> Physical and External Domains -> External Routed Domains**
- Create an External Routed Domain and link it to the VLAN Pool based on the following:
 - Name: **EXT-L3-PORTS**
 - VLAN Pool: **VLAN-POOL-L3**

Lab 11 - Access Provisioning - AAEP

Physical Topology



Access Provisioning – AAEP

- Link the Port Types (Domains/VLANs) to IPGs (Physical Ports)

Task 1 – Create a AAEP for Physical ACI Ports

- Click **Fabric -> Access Policies -> Global Policies -> AAEP**
- Create an AAEP for ACI Ports and link it to the Domain & IPGs based on the following:
 - Name: **AAEP-ACI**
 - Domain: **ACI-PORTS**
 - IPGs: **IPG-CLIENTS & IPG-SERVERS**

Task 2 – Create a AAEP for External L2 Ports

- Click **Fabric -> Access Policies -> Global Policies -> AAEP**
- Create an AAEP for ACI Ports and link it to the Domain & IPGs based on the following:
 - Name: **AAEP-L2-PORTS**
 - Domain: **EXT-L2-PORTS**
 - IPGs: **IPG-SW1, IPG-SW2-PC, IPG-SW3-PC & IPG-SW4-vPC**

Task 3 – Create a AAEP for External L3 Ports

- Click **Fabric -> Access Policies -> Global Policies -> AAEP**
- Create an AAEP for ACI Ports and link it to the Domain & IPGs based on the following:
 - Name: **AAEP-L3-PORTS**
 - Domain: **EXT-L3-PORTS**
 - IPGs: **IPG-ROUTERS**

This completes the Access Provisioning Process. The next set of labs will repeat it for a different physical topology.

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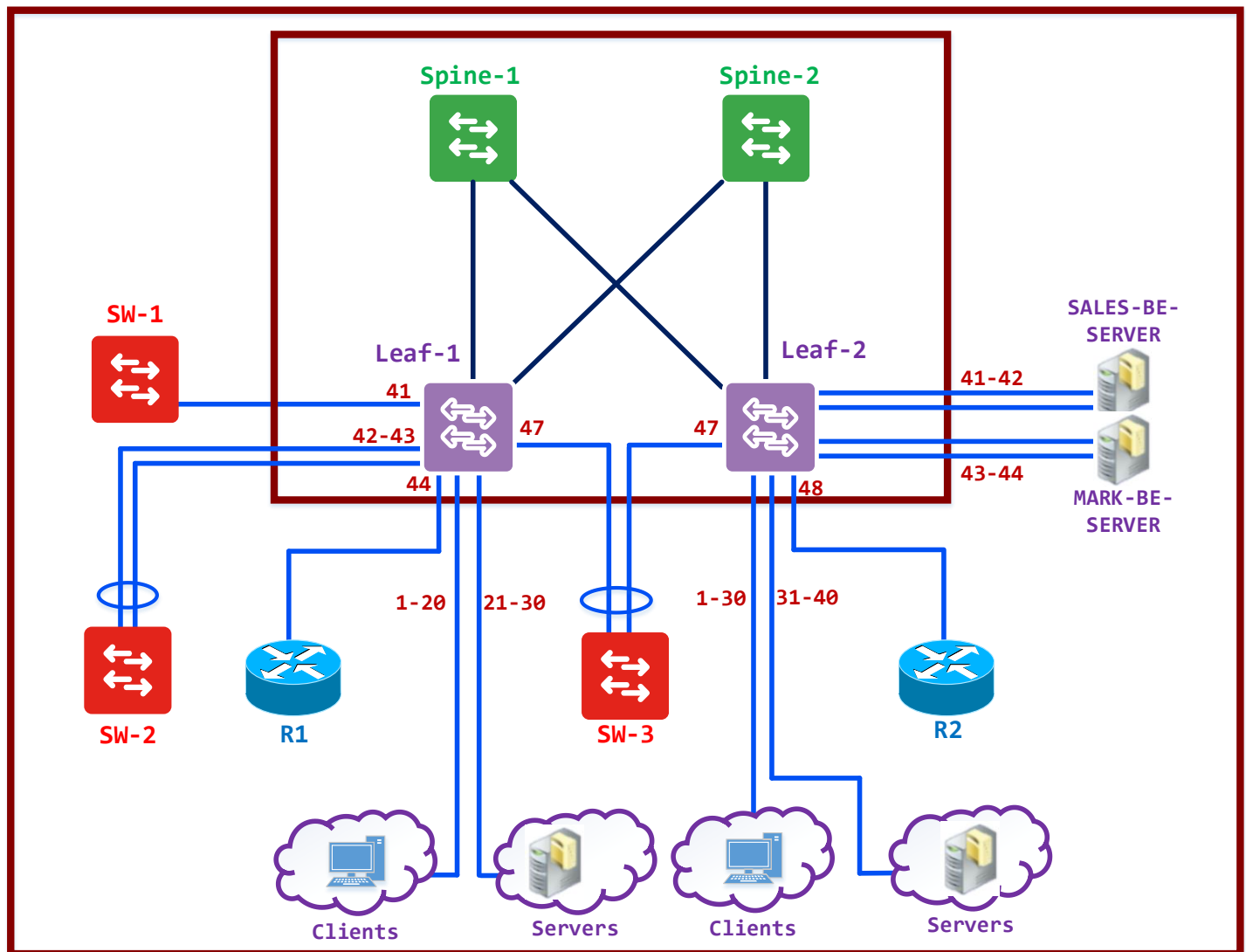
CCDE # 20110020

Access Provisioning – Topology II



Lab 12 – Access Provisioning – Interface Policies

Physical Topology



Access Provisioning – Access Port Interface Policies

Note: The Access Provisioning labs are based on the Fabric Provisioning completed in Lab 1.

- You are planning on configuring the above topology for ACI. Besides the devices displayed above, the Servers & Clients will be connected to the following ports on the 2 Leaf switches.
 - **Clients**
 - LEAF-01 – Ports 1/1 – 20
 - LEAF-02 – Ports 1/1 – 30
 - **Servers**
 - LEAF-01 – Ports 1/21 – 30
 - LEAF-02 – Ports 1/31 – 40

- The port properties for the Devices will be based on the following table:

	Clients	Servers	Routers	Switches
CDP	Disabled	Disabled	Enabled	Enabled
LLDP	Disabled	Enabled	Disabled	Disabled
Port Security	1	5	1	
Storm Control	50%	60%		60%
Speed	1G	10G	10G	40G
STP	Enabled	Enabled	Enabled	

- Configure all the Policies defined in the table above.

Task 1 – Configure the Interface Policies – CDP

- Click **Fabric -> Access Policies -> Interface Policies -> Policies -> CDP Policies**

- Configure CDP Policies based on the following:
 - **Policy # 1**
 - Name: **CDP-ON**
 - Admin-State: **Enabled**
 - **Policy # 2**
 - Name: **CDP-OFF**
 - Admin-State: **Disabled**

Task 2 – Configure the Interface Policies – LLDP

- Click **Fabric -> Access Policies -> Interface Policies -> Policies -> LLDP Policies**
- Configure LLDP Policies based on the following:
 - **Policy # 1**
 - Name: **LLDP-ON**
 - Transmit – **Enabled**
 - Receive – **Enabled**
 - **Policy # 2**
 - Name: **LLDP-OFF**
 - Transmit – **Disabled**
 - Receive – **Disabled**

Task 3 – Configure the Interface Policies – Link Level

- Click **Fabric -> Access Policies -> Interface Policies -> Policies -> Link Level**
- Configure Link Level Policies based on the following:
 - **Policy # 1**
 - Name: **1G-AUTO**
 - Speed – **1 gbps**
 - **Policy # 2**
 - Name: **10G-AUTO**
 - Speed – **10 gbps**
 - **Policy # 3**
 - Name: **40G-AUTO**
 - Speed – **40 gbps**

Task 4 – Configure the Interface Policies –Port Security

- Click **Fabric -> Access Policies -> Interface Policies -> Policies -> Port Security**
- Configure Port-Security Policies based on the following:
 - **Policy # 1**
 - Name: **PS-1**
 - Parameters: **Maximum EndPoints – 1**
 - **Policy # 2**
 - Name: **PS-5**
 - Parameters: **Maximum EndPoints – 5**

Task 5 – Configure the Interface Policies – Storm Control

- Click **Fabric -> Access Policies -> Interface Policies -> Policies -> Storm Control**
- Configure Storm Control Policies based on the following:
 - **Policy # 1**
 - Name: **SC-50**
 - Percentages: **50**
 - **Policy # 2**
 - Name: **SC-60**
 - Percentages: **60**

Task 6 – Configure the Interface Policies – Storm Control

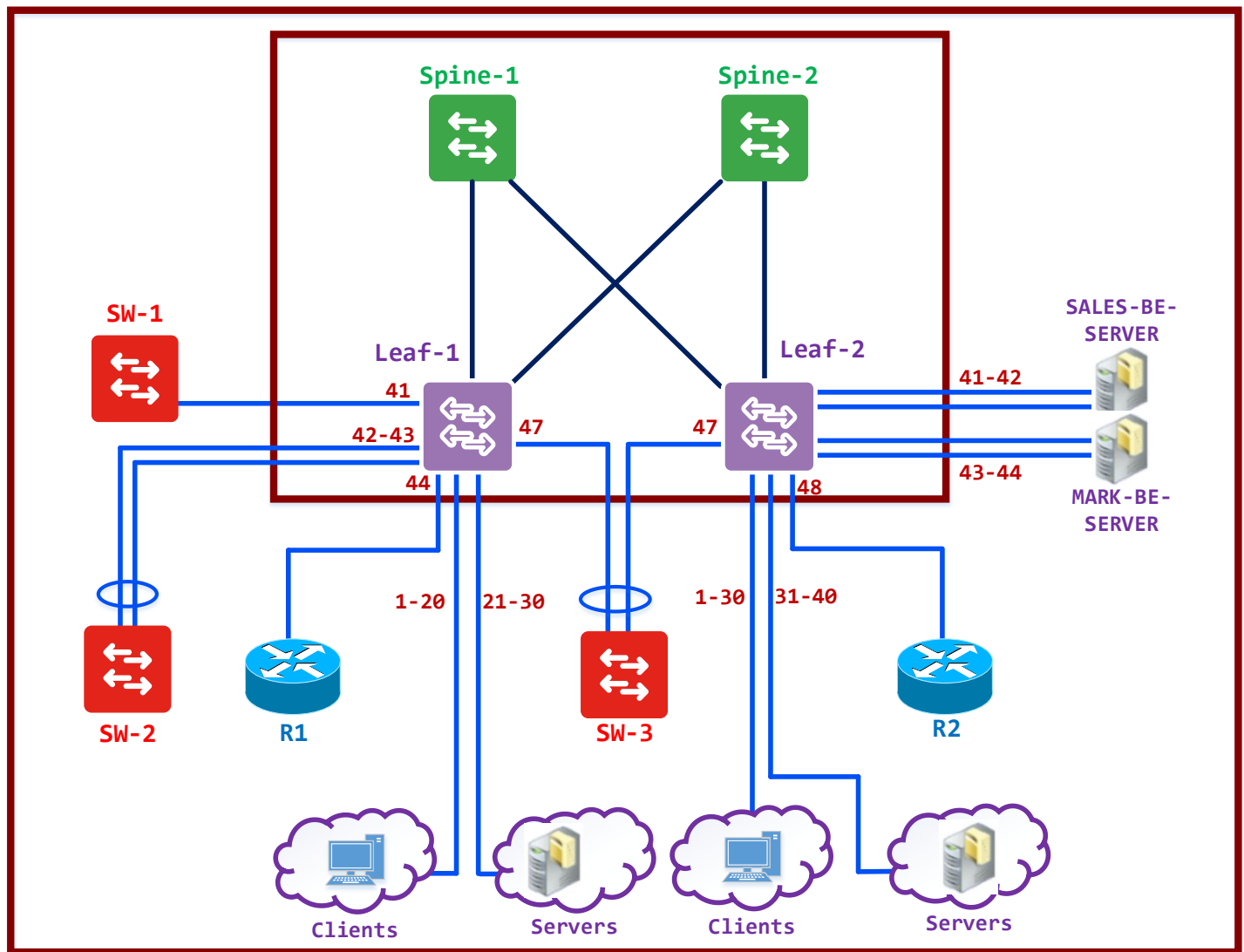
- Click **Fabric -> Access Policies -> Interface Policies -> Policies -> Storm Control**
- Configure Storm Control Policies based on the following:
 - **Policy # 1**
 - Name: **SC-50**
 - Percentages: **50**
 - **Policy # 2**
 - Name: **SC-60**
 - Percentages: **60**

Task 7 – Configure the Interface Policies – BPDU Guard

- Click **Fabric -> Access Policies -> Interface Policies -> Policies -> Spanning Tree**
- Configure Spanning Tree Policies based on the following:
 - **Policy # 1**
 - Name: **STP-BPDUGUARD**
 - BPDU Guard: **Enabled**

Lab 13 – Access Provisioning – Leaf Access Port IPs

Physical Topology



Access Provisioning – Leaf Access Port IPGs

- Configure the IPGs for Clients, Servers & Routers based on the table below. Switch IPG's will be created later.

	Clients	Servers	Routers	Switches
CDP	Disabled	Disabled	Enabled	Enabled
LLDP	Disabled	Enabled	Disabled	Disabled
Port Security	1	5	1	
Storm Control	50%	60%		60%
Speed	1G	10G	10G	40G
STP	Enabled	Enabled	Enabled	

Task 1 – Configure the Interface Policy Groups – Clients

- Click **Fabric -> Access Policies -> Interface Policies -> Policy Groups -> Leaf-Access-Port**
- Configure Client IPGs based on the following:
 - Name: **IPG-CLIENTS**
 - CDP: **CDP-OFF**
 - LLDP: **LLDP-OFF**
 - Port Security: **PS-1**
 - Storm Control: **SC-50**
 - Link Level: **1G-AUTO**
 - Spanning Tree: **STP-BPDUGUARD**

Task 2 – Configure the Interface Policy Groups – Servers

- Click **Fabric -> Access Policies -> Interface Policies -> Policy Groups -> Leaf-Access-Port**
- Configure Client IPGs based on the following:
 - Name: **IPG-SERVERS**
 - CDP: **CDP-OFF**
 - LLDP: **LLDP-ON**
 - Port Security: **PS-5**
 - Storm Control: **SC-60**
 - Link Level: **10G-AUTO**
 - Spanning Tree: **STP-BPDUGUARD**

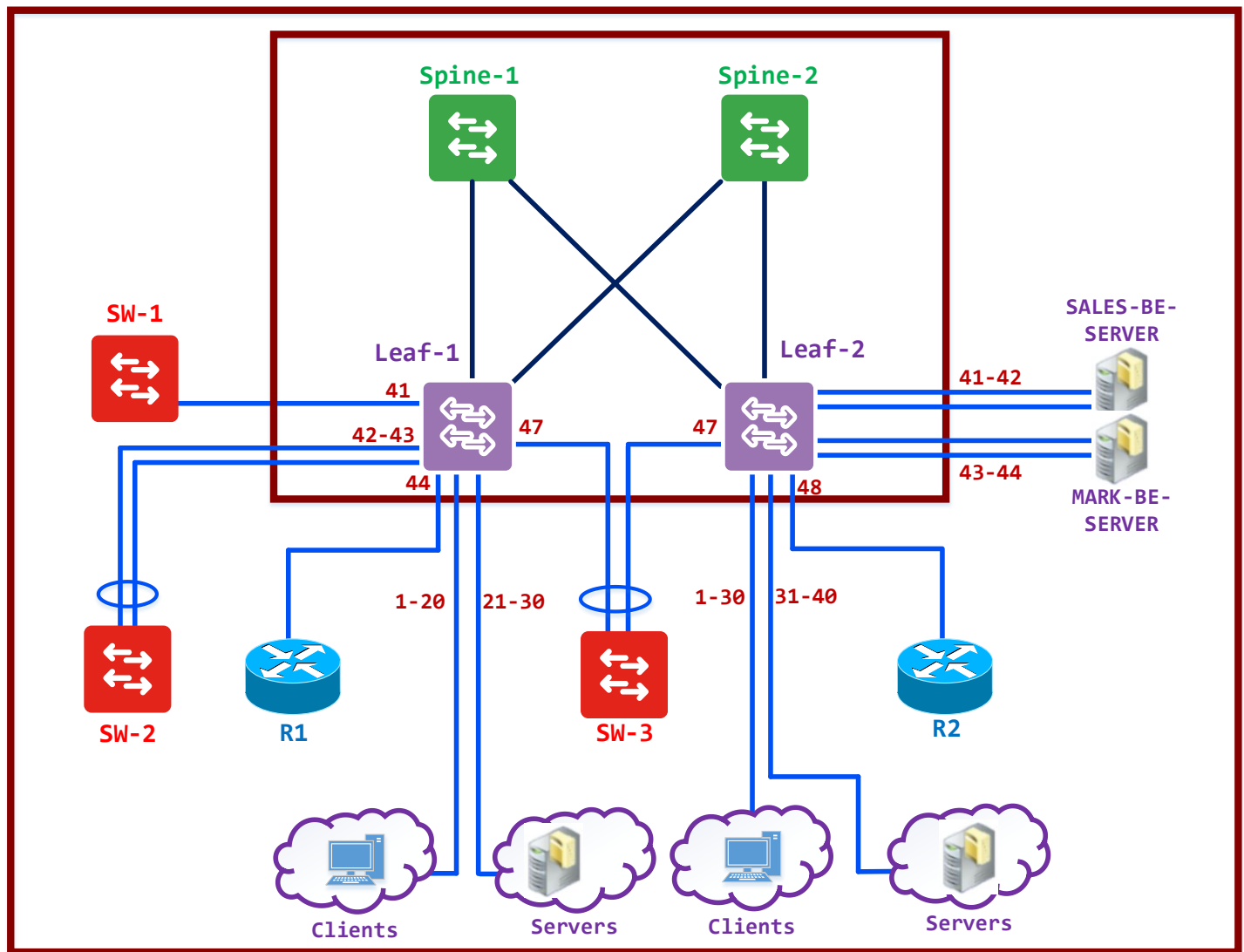
Task 3 – Configure the Interface Policy Groups – Routers

- Click **Fabric -> Access Policies -> Interface Policies -> Policy Groups -> Leaf-Access-Port**

- Configure Client IPGs based on the following:
 - Name: **IPG-ROUTERS**
 - CDP: **CDP-ON**
 - LLDP: **LLDP-OFF**
 - Port Security: **PS-1**
 - Link Level: **10G-AUTO**
 - Spanning Tree: **STP-BPDUGUARD**

Lab 14 – Access Provisioning – Switch & PC IPGs

Physical Topology



Access Provisioning – Port Channel IPGs

- Configure the IPGs for SW1 & SW2 based on the table below. Use LACP Active for the Port-Channel Protocol. SW3 IPG will be created later.

	Clients	Servers	Routers	Switches
CDP	Disabled	Disabled	Enabled	Enabled
LLDP	Disabled	Enabled	Disabled	Disabled
Port Security	1	5	1	
Storm Control	50%	60%		60%
Speed	1G	10G	10G	40G
STP	Enabled	Enabled	Enabled	

Task 1 – Configure the Interface Policies – Port-Channel

- Click **Fabric -> Access Policies -> Interface Policies -> Policies -> Port-Channel**
- Configure Port-Channel Policy based on the following:
 - **Policy # 1**
 - Name: **LACP-Active**
 - Mode: **Active**

Task 2 – Configure the Interface Policy Groups – SW1

- Click **Fabric -> Access Policies -> Interface Policies -> Policy Groups -> Leaf-Access-Port**
- Configure Client IPGs based on the following:
 - Name: **IPG-SW1**
 - CDP: **CDP-OFF**
 - LLDP: **LLDP-ON**
 - Storm Control: **SC-60**
 - Link Level: **40G-AUTO**

Task 3 – Configure the Interface Policy Groups – SW2

- Click **Fabric -> Access Policies -> Interface Policies -> Policy Groups -> PC Policy Group**
- Configure Client IPGs based on the following:
 - Name: **IPG-SW2-PC**
 - CDP: **CDP-OFF**
 - LLDP: **LLDP-ON**
 - Storm Control: **SC-60**
 - Link Level: **40G-AUTO**
 - Port Channel: **LACP-Active**

Task 4 – Configure the Interface Policy Groups – SALES-BE-SERVER

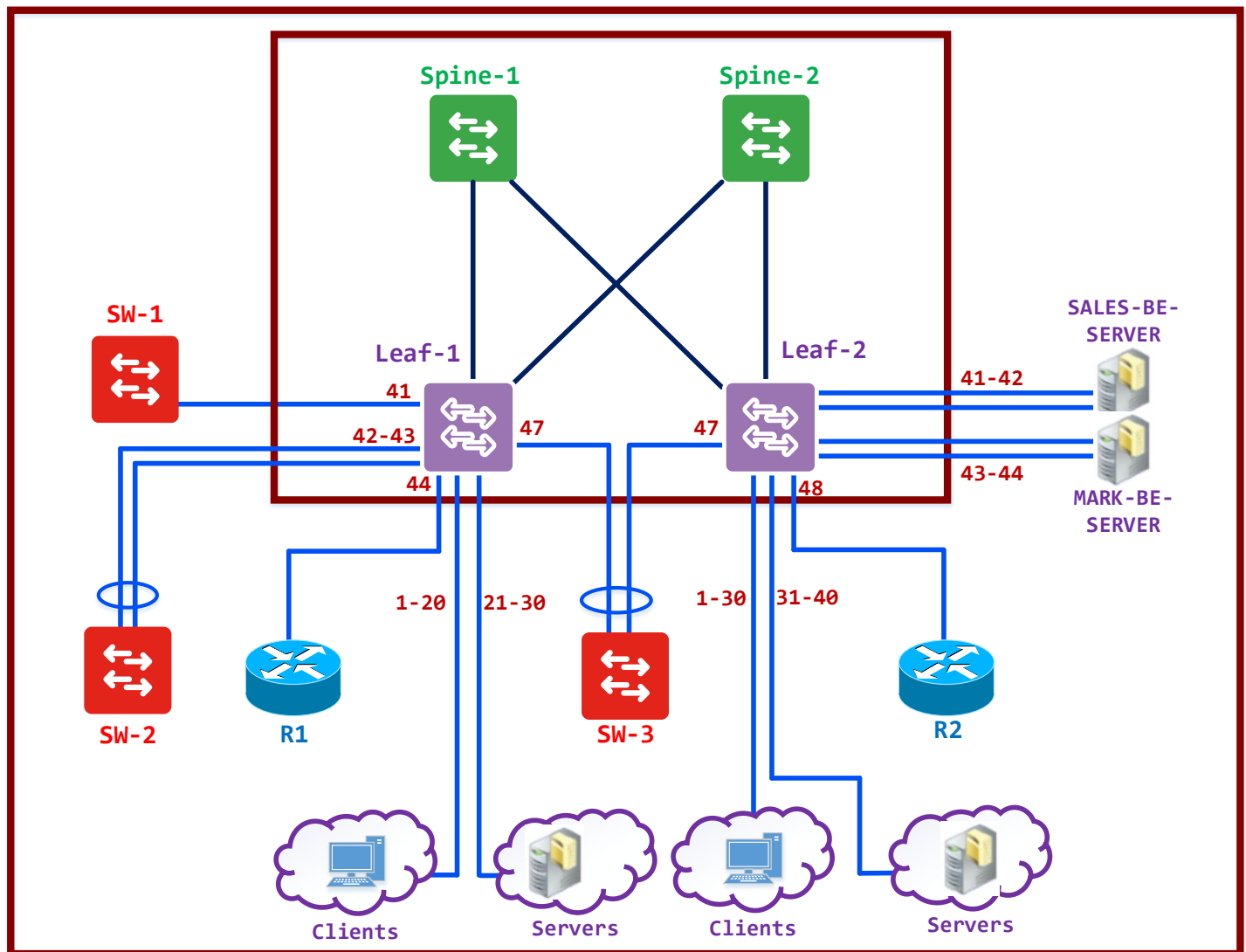
- Click **Fabric -> Access Policies -> Interface Policies -> Policy Groups -> PC Policy Group**
- Configure Client IPGs based on the following:
 - Name: **IPG-SALES-BE-PC**
 - CDP: **CDP-OFF**
 - LLDP: **LLDP-ON**
 - Port Security: **PS-5**
 - Storm Control: **SC-60**
 - Link Level: **10G-AUTO**
 - Spanning Tree: **STP-BPDUGUARD**
 - Port Channel: **LACP-Active**

Task 5 – Configure the Interface Policy Groups – MARK-BE-SERVER

- Click **Fabric -> Access Policies -> Interface Policies -> Policy Groups -> PC Policy Group**
- Configure Client IPGs based on the following:
 - Name: **IPG-MARK-BE-PC**
 - CDP: **CDP-OFF**
 - LLDP: **LLDP-ON**
 - Port Security: **PS-5**
 - Storm Control: **SC-60**
 - Link Level: **10G-AUTO**
 - Spanning Tree: **STP-BPDUGUARD**
 - Port Channel: **LACP-Active**

Lab 15 – Access Provisioning – Configuring vPC Domain

Physical Topology



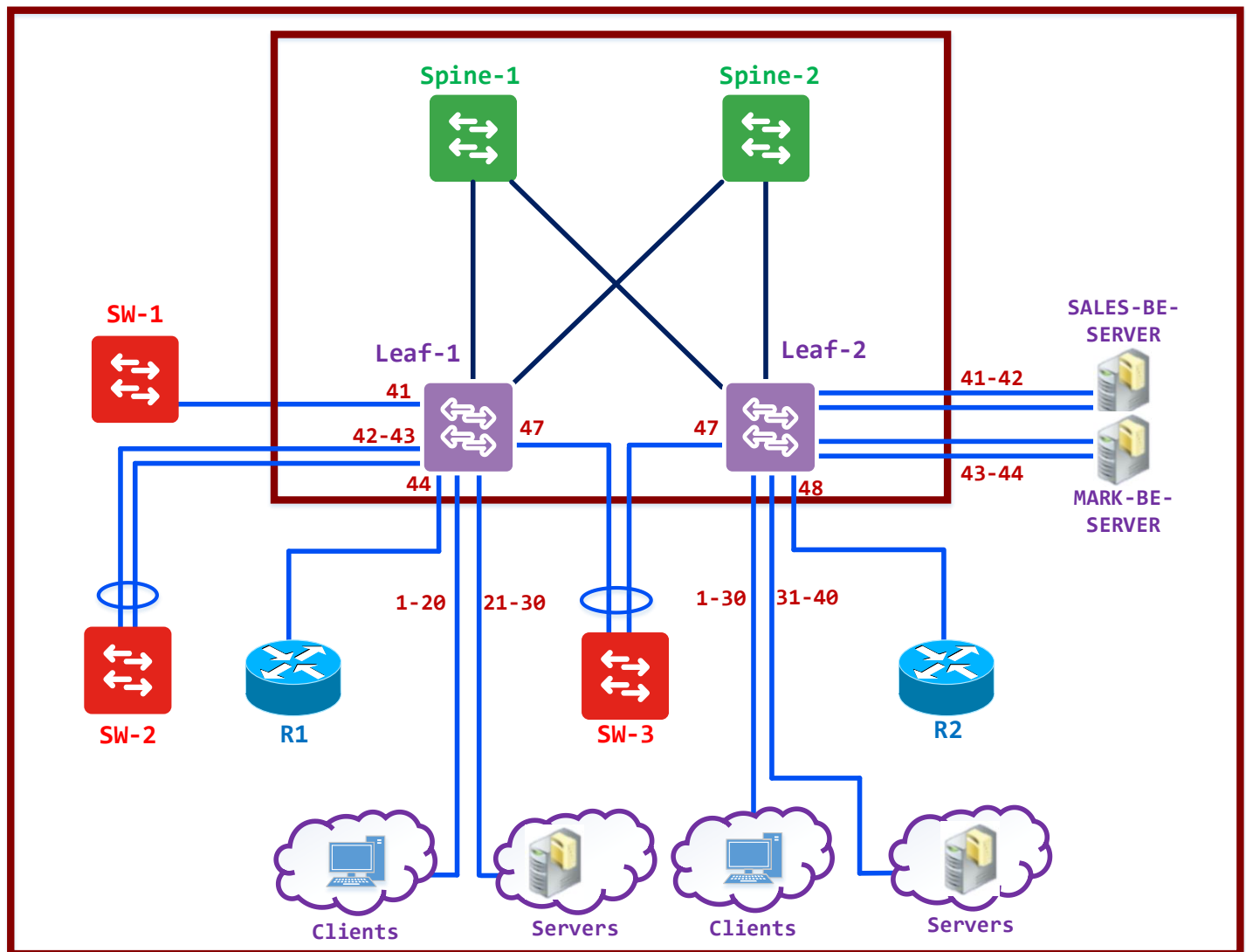
Access Provisioning – vPC

Task 1 – Configure a vPC Domain between Leaf-01 & Leaf-02

- Click **Fabric -> Access Policies -> Switch Policies -> Policies -> Virtual Port Channel Default**
- Configure a vPC between Leaf-01 & Leaf-02. Use the following parameters:
 - Name: **vPC-LEAF-01-02**
 - Domain ID: **12**
 - VPC Domain Policy: **Default**
 - Switch 1: **101**
 - Switch 2: **102**

Lab 16 – Access Provisioning – vPC IPG

Physical Topology



Access Provisioning – Virtual Port Channel IPGs

- Configure a IPG for a SW4 based on the table below. Use LACP Active for the Port-Channel Protocol.

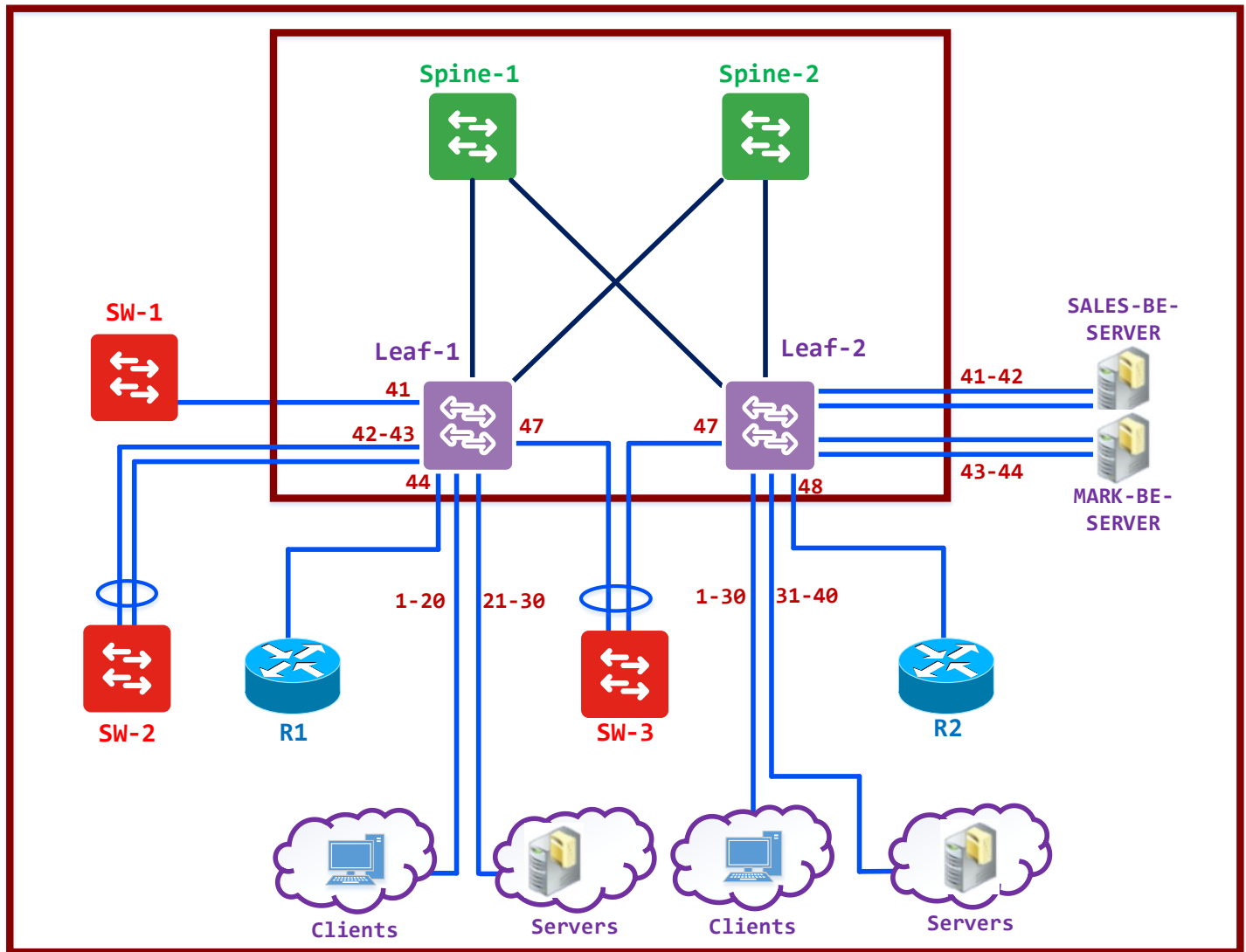
	Clients	Servers	Routers	Switches
CDP	Disabled	Disabled	Enabled	Enabled
LLDP	Disabled	Enabled	Disabled	Disabled
Port Security	1	5	1	
Storm Control	50%	60%		60%
Speed	1G	10G	10G	40G
STP	Enabled	Enabled	Enabled	

Task 2 – Configure the Interface Policy Groups – SW3

- Click **Fabric -> Access Policies -> Interface Policies -> Policy Groups -> vPC Policy Group**
- Configure Client IPGs based on the following:
 - Name: **IPG-SW3-vPC**
 - CDP: **CDP-OFF**
 - LLDP: **LLDP-ON**
 - Storm Control: **SC-60**
 - Link Level: **40G-AUTO**
 - Port Channel: **LACP-Active**

Lab 17 – Access Provisioning – Interface Profile

Physical Topology



Access Provisioning – Leaf Interface Profile

- You are planning on configuring the above topology for ACI. Besides the devices displayed above, the Servers & Clients will be connected to the following ports on the 2 Leaf switches.

Task 1 – Configure Interface Profiles

- Click **Fabric -> Access Policies -> Interface Policies -> Policy Groups -> vPC Policy Group**
- Configure an Interface Profiles based on the following:

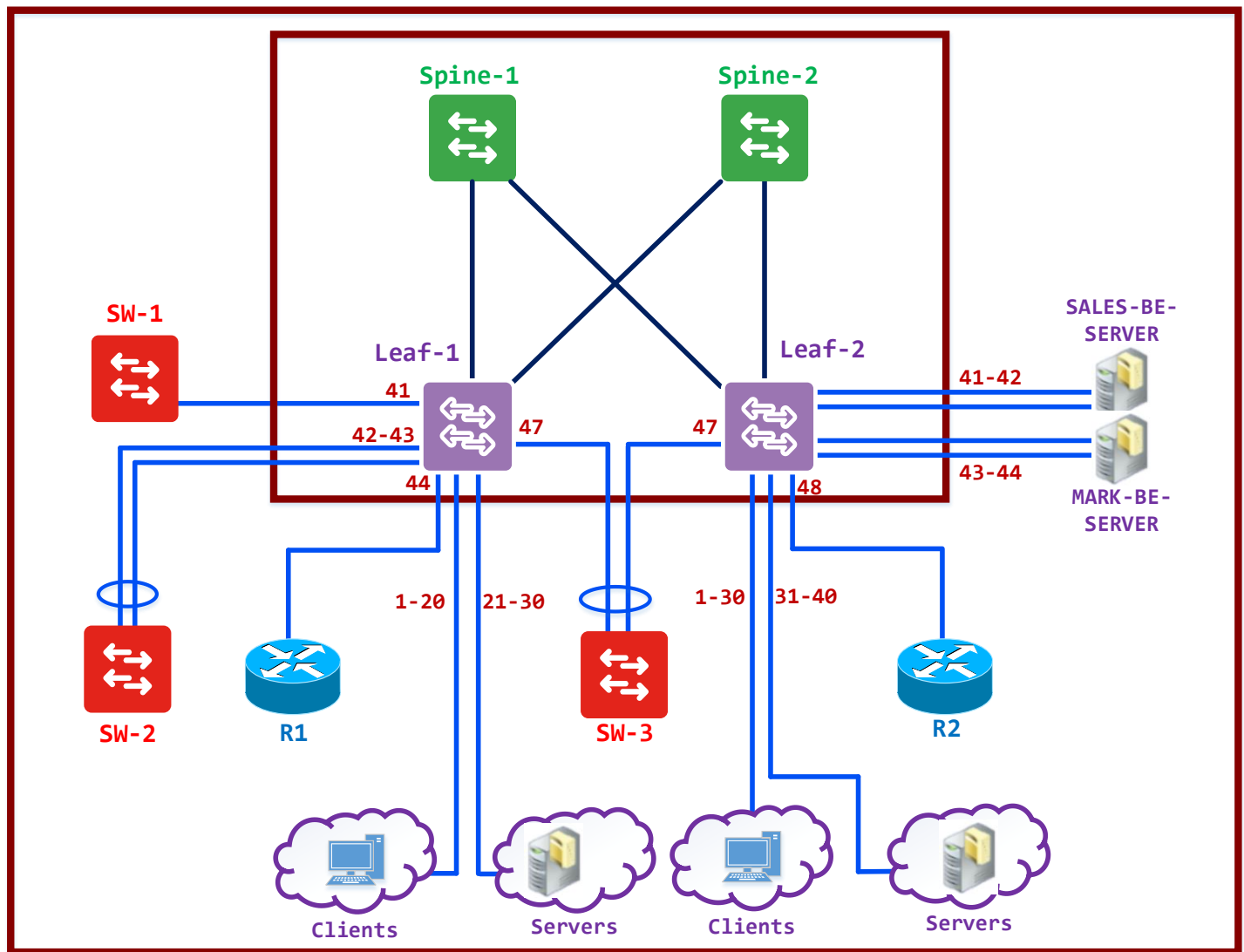
Interface Profile: INT-PROF-1		
Interface Names	Ports	IPGs
E1-15-CLIENTS	1/1-20	IPG-CLIENTS
E16-25-SERVERS	1/21-30	IPG-SERVERS
E41-SW1	1/41	IPG-SW1
E42-43-SW2-PC	1/42-43	IPG-SW2-PC
E44-45-ROUTERS	1/44-45	IPG-ROUTERS
E47-SW3-vPC	1/47	IPG-SW3-vPC

- Configure an Interface Profiles based on the following:

Interface Profile: INT-PROF-2		
Interface Names	Ports	IPGs
E1-20-CLIENTS	1/1-30	IPG-CLIENTS
E21-28-SERVERS	1/31-40	IPG-SERVERS
E41-42-SALES-BE-SERVER	1/41-42	IPG-SALES-BE-PC
E43-44-SALES-BE-SERVER	1/43-44	IPG-MARK-BE-PC
E47-SW3-vPC	1/47	IPG-SW3-vPC
E48-ROUTERS	1/48	IPG-ROUTERS

Lab 18 – Access Provisioning – Switch Profile

Physical Topology



Access Provisioning – Leaf Switch Profile

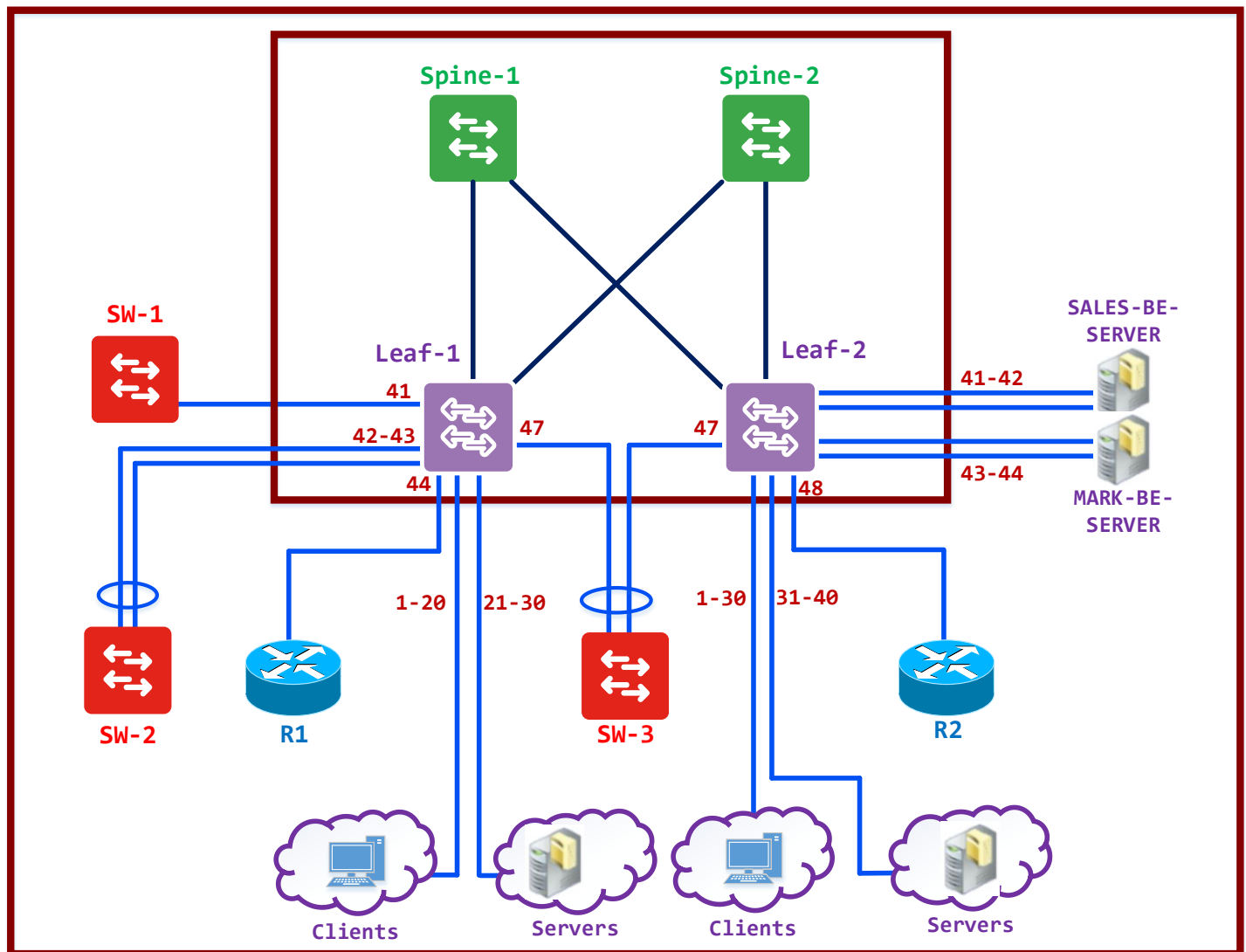
- Assign the Interface Profiles created in the previous labs to the appropriate Leaf Switches.

Task 1 – Configure Switch Profiles

- Click **Fabric -> Access Policies -> Switch Policies -> Profiles**
- Configure a Switch Profile based on the following:
 - Name: **SW-PROF-1**
 - Leaf Name: **LEAF-01**
 - Leaf Node ID: **101**
 - Interface profile: **INT-PROF-1**
- Configure a Switch Profile based on the following:
 - Name: **SW-PROF-2**
 - Leaf Name: **LEAF-02**
 - Leaf Node ID: **102**
 - Interface profile: **INT-PROF-2**

Lab 19 – Access Provisioning – VLAN Pools

Physical Topology



Access Provisioning – VLAN Pool

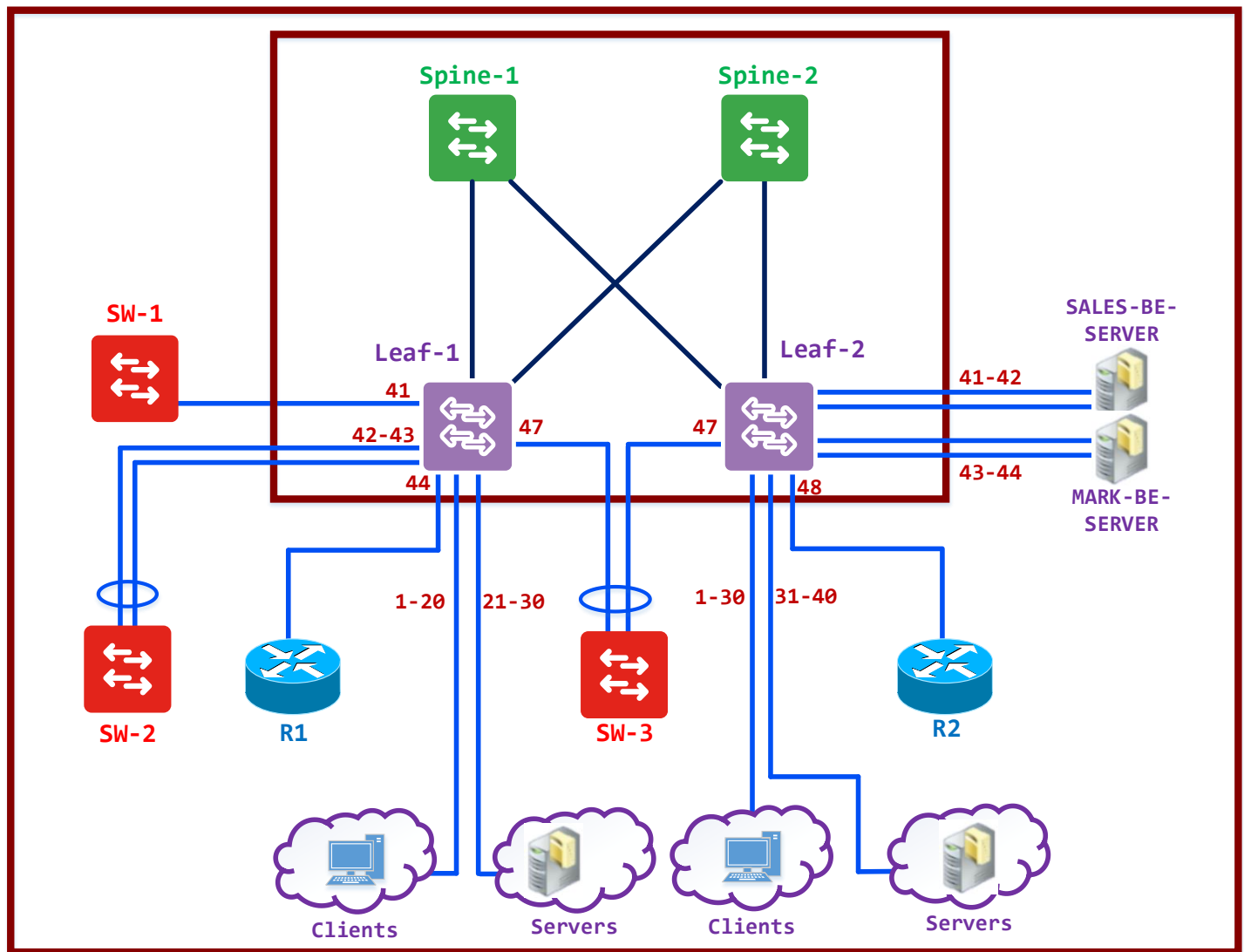
- Create a VLAN Pool to be assigned to the Domain

Task 1 – Configure VLAN Pool

- Click **Fabric -> Access Policies -> Pools -> VLANS**
- Create a Pool of VLANs that will be used within ACI for Physical ACI Ports:
 - Name: **VLAN-POOL-ACI**
 - Leaf Name: **Static Allocation**
 - Range: **1-500**
- Create a Pool of VLANs that will be used within ACI for External Bridged Ports ACI Ports:
 - Name: **VLAN-POOL-L2**
 - Leaf Name: **Static Allocation**
 - Range: **400-500**
- Create a Pool of VLANs that will be used within ACI for External Routed Ports ACI Ports:
 - Name: **VLAN-POOL-L3**
 - Leaf Name: **Static Allocation**
 - Range: **1-400**

Lab 20 – Access Provisioning – Domains

Physical Topology



Access Provisioning – Domains

- Create Domains to specify port types.

Task 1 – Configure a Physical Domain (Physical ACI Ports)

- Click **Fabric -> Access Policies -> Physical and External Domains -> Physical Domains**
- Create a Physical Domain and link it to the VLAN Pool based on the following:
 - Name: **ACI-PORTS**
 - VLAN Pool: **VLAN-POOL-ACI**

Task 2 – Configure an External L2 Domain (Connecting to Non-ACI Switches for L2OUT)

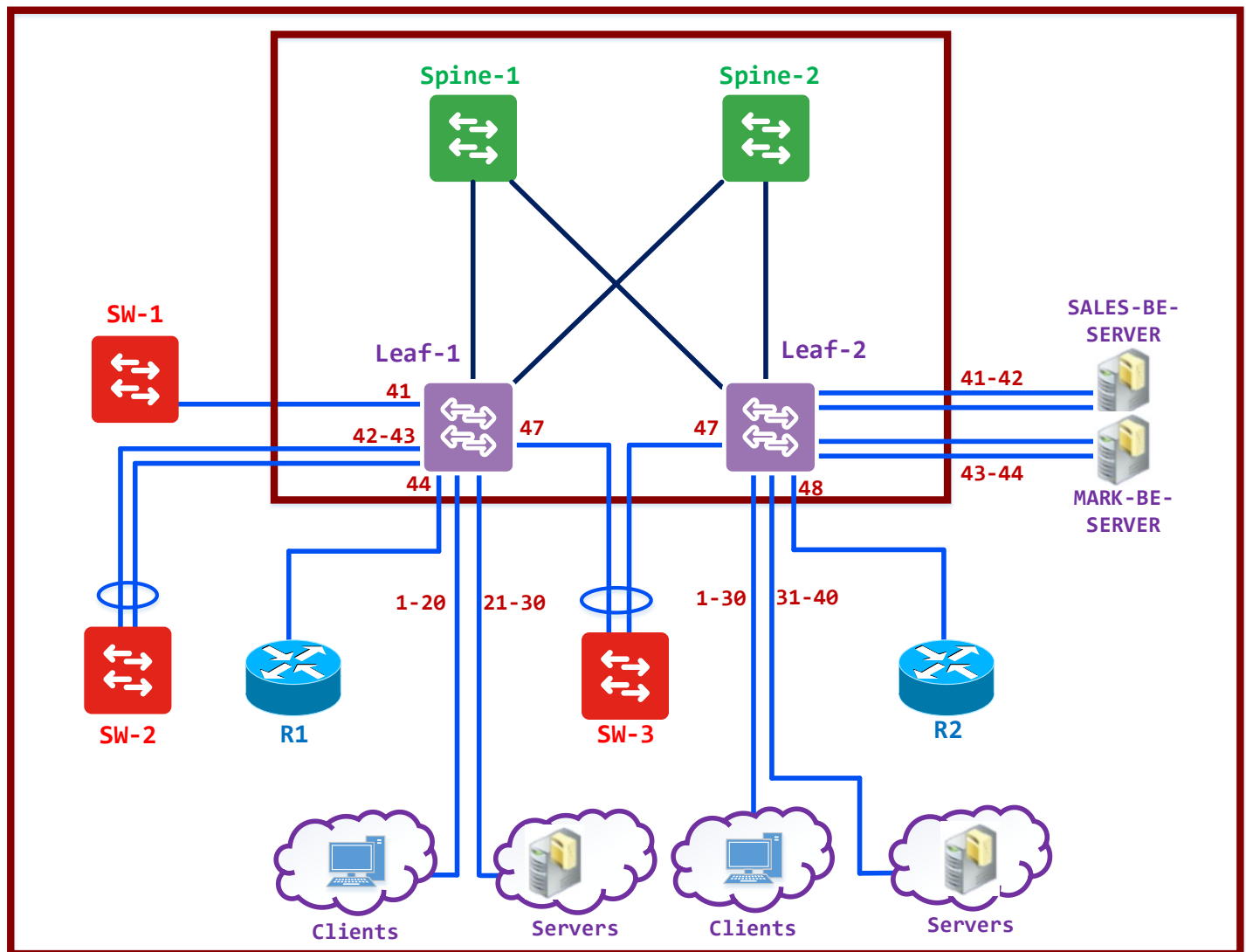
- Click **Fabric -> Access Policies -> Physical and External Domains -> External Bridged Domain**
- Create an External Brige Domain and link it to the VLAN Pool based on the following:
 - Name: **EXT-L2-PORTS**
 - VLAN Pool: **VLAN-POOL-L2**

Task 3 – Configure an External L3 Domain (Connecting to Non-ACI L3 Devices for L3OUT)

- Click **Fabric -> Access Policies -> Physical and External Domains -> External Routed Domains**
- Create an External Routed Domain and link it to the VLAN Pool based on the following:
 - Name: **EXT-L3-PORTS**
 - VLAN Pool: **VLAN-POOL-L3**

Lab 21 – Access Provisioning – AAEP

Physical Topology



Access Provisioning – AAEP

- Link the Port Types (Domains/VLANs) to IPGs (Physical Ports)

Task 1 – Create a AAEP for Physical ACI Ports

- Click **Fabric -> Access Policies -> Global Policies -> AAEP**
- Create an AAEP for ACI Ports and link it to the Domain & IPGs based on the following:
 - Name: **AAEP-ACI**
 - Domain: **ACI-PORTS**
 - IPGs: **IPG-CLIENTS, IPG-SERVERS, IPG-SALES-BE-PC & IPG-MARK-BE-PC**

Task 2 – Create a AAEP for External L2 Ports

- Click **Fabric -> Access Policies -> Global Policies -> AAEP**
- Create an AAEP for ACI Ports and link it to the Domain & IPGs based on the following:
 - Name: **AAEP-L2-PORTS**
 - Domain: **EXT-L2-PORTS**
 - IPGs: **IPG-SW1, IPG-SW2-PC & IPG-SW3-vPC**

Task 3 – Create a AAEP for External L3 Ports

- Click **Fabric -> Access Policies -> Global Policies -> AAEP**
- Create an AAEP for ACI Ports and link it to the Domain & IPGs based on the following:
 - Name: **AAEP-L3-PORTS**
 - Domain: **EXT-L3-PORTS**
 - IPGs: **IPG-ROUTERS**

Implementing ACI

Authored By:

Khawar Butt

CCIE # 12353

Hepta CCIE#12353

CCDE # 20110020

Tenant Provisioning



Lab 22 – Tenant Provisioning – Creating a Tenant & VRF

Logical Topology

Tenant : KBITS

VRF : GRT

Bridge Domain : BD1

Subnets:
10.1.1.0/24
10.1.2.0/24
10.1.3.0/24

Tenant Provisioning – Creating a Tenant

Note: The Access Provisioning labs are based on the Access Provisioning completed in Lab 21.

Task 1 – Create the Tenant

- Click **Tenant -> Add a Tenant**
- Create a Tenant based on the following:
 - Name: **KBITS**

Task 2 – Create a VRF

- Create a VRF within Tenant **KBITS** based on the following:
 - Name: **GRT**
- Click **Tenant -> KBITS -> Networking -> VRF -> Create**
- Create a VRF based on the information above.

Lab 23 – Tenant Provisioning – Creating a Bridge Domain

Logical Topology

Tenant : KBITS

VRF : GRT

Bridge Domain : BD1

Subnets:
10.1.1.0/24
10.1.2.0/24
10.1.3.0/24

Tenant Provisioning – Creating a Bridge Domain

Task 1 – Create a Bridge Domain

- Create a Bridge Domain within Tenant **KBITS** based on the following:
 - Name: **BD1**
 - VRF: **GRT**
 - Subnets/GW: **10.1.1.254/24, 10.1.2.254/24 & 10.1.3.254/24**
- Click **Tenant -> KBITS -> Networking -> Bridge Domain -> Create**
- Create the Bridge Domain based on the information above.
- Configure the Subnets/GW based on the information above.

Implementing ACI

Authored By:

Khawar Butt

CCIE # 12353

Hepta CCIE#12353

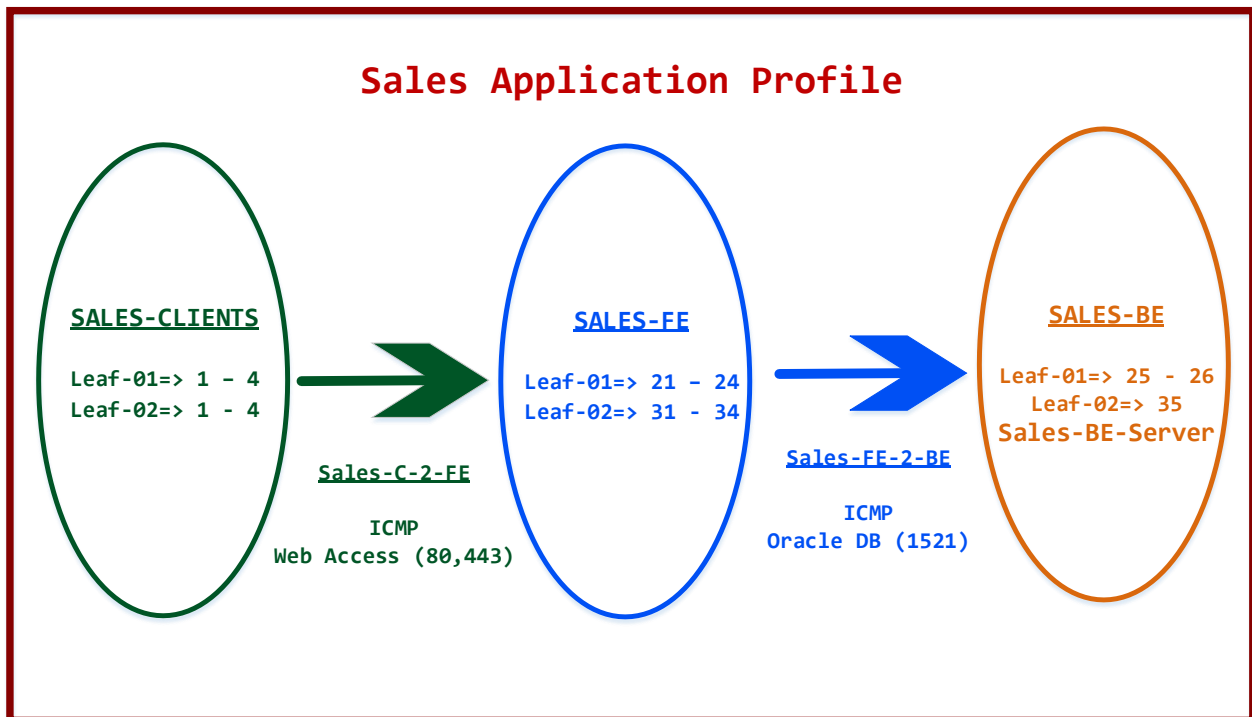
CCDE # 20110020

Application Provisioning



Lab 24 – Application Provisioning – Creating Application Profile and EPGs for Sales

Sales Application



Application Provisioning – Creating an Application Profile

Note: The Application Provisioning labs are based on the Successful completion of Lab 23.

Task 1 – Create an Application Profile

- Click **Tenant -> KBITS -> Application Profiles -> Create**
- Create an Application Profile based on the following:
 - Name: **SALES-APPS**

Task 2 – Create EndPoint Groups (EPGs)

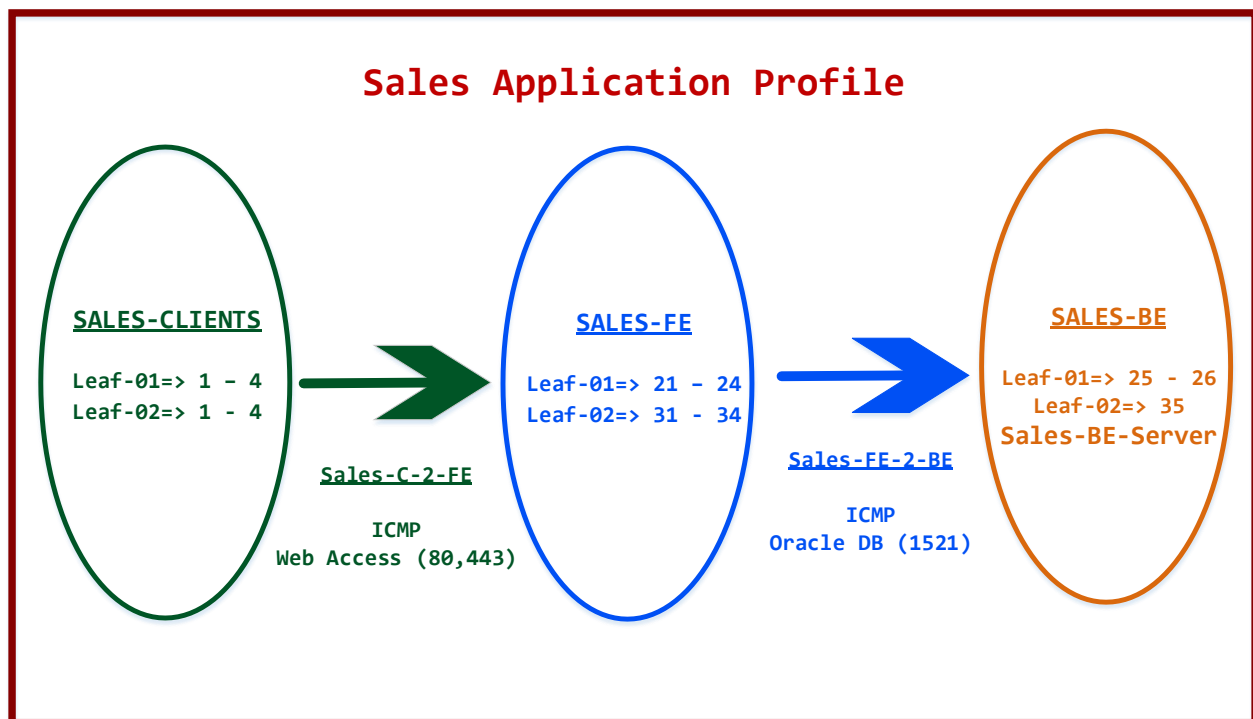
- Create EPGs based on the following:
 - Name: **SALES-CLIENTS**
 - Bridge domain: **BD1**

 - Name: **SALES-FE**
 - Bridge domain: **BD1**

 - Name: **SALES-BE**
 - Bridge domain: **BD1**
- Click **Tenant -> KBITS -> Application Profiles -> SALES-APPLICATION-PROFILE -> Application EPGs -> Create**
- Create 3 EPGs based on the information above.

Lab 25 – Application Provisioning – Assign Ports to EPGs in the Sales Application Profile

Sales Application



Application Provisioning – Port Assignments

Task 1 – Assign ports to the “SALES Client” EPGs

- Click **Tenant -> KBITS -> Application Profiles -> SALES-APPLICATION-PROFILE -> Application EPGs -> SALES-CLIENTS -> Static Ports**
- Assign Ports to the **SALES-CLIENT** EPG based on the following:

Port	VLAN	Port-Type	Deployment
LEAF-01 – 1 / 1	10	Access	Immediate
LEAF-01 – 1 / 2	10	Access	Immediate
LEAF-01 – 1 / 3	10	Access	Immediate
LEAF-01 – 1 / 4	10	Access	Immediate
LEAF-02 – 1 / 1	10	Access	Immediate
LEAF-02 – 1 / 2	10	Access	Immediate
LEAF-02 – 1 / 3	10	Access	Immediate
LEAF-02 – 1 / 4	10	Access	Immediate

Task 2 – Assign ports to the “SALES FE” EPGs

- Click **Tenant -> KBITS -> Application Profiles -> SALES-APPLICATION-PROFILE -> Application EPGs -> SALES-FE -> Static Ports**
- Assign Ports to the **SALES-FE** EPG based on the following:

Port	VLAN	Port-Type	Deployment
LEAF-01 – 1 / 21	20	Trunk	Immediate
LEAF-01 – 1 / 22	20	Trunk	Immediate
LEAF-01 – 1 / 23	20	Trunk	Immediate
LEAF-01 – 1 / 24	20	Trunk	Immediate
LEAF-02 – 1 / 31	20	Trunk	Immediate
LEAF-02 – 1 / 32	20	Trunk	Immediate
LEAF-02 – 1 / 33	20	Trunk	Immediate
LEAF-02 – 1 / 34	20	Trunk	Immediate

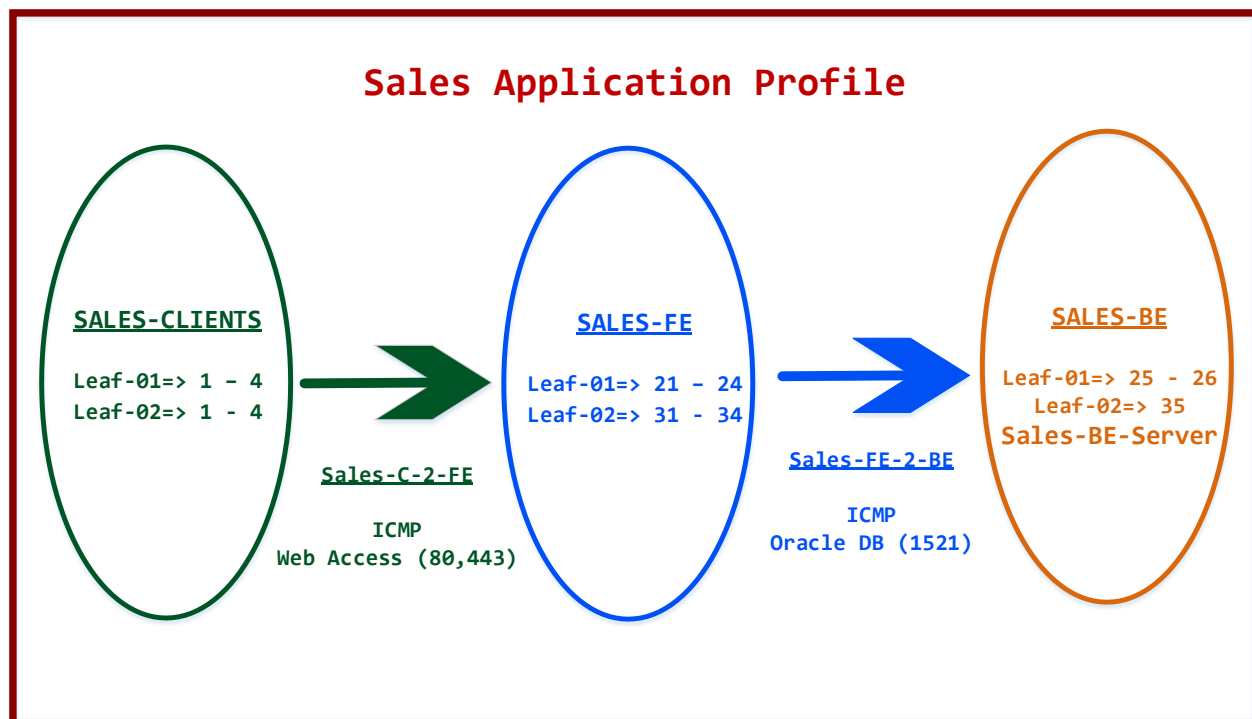
Task 3 – Assign ports to the “SALES BE” EPGs

- Click **Tenant -> KBITS -> Application Profiles -> SALES-APPLICATION-PROFILE -> Application EPGs -> SALES-BE -> Static Ports**
- Assign Ports to the **SALES-BE** EPG based on the following:

Port	VLAN	Port-Type	Deployment
LEAF-01 – 1 /25	30	Trunk	Immediate
LEAF-01 – 1 /26	30	Trunk	Immediate
LEAF-02 – 1 /35	30	Trunk	Immediate
SALES-BE-PC	30	Trunk	Immediate

Lab 26 – Application Provisioning – Creating Filters based on Sales Application

Sales Application



Application Provisioning – Creating Filters

Task 1 – Create a Filter for Web-Access

- Click **Tenant -> KBITS -> Security Policies -> Filters -> Create**
- Create a Filter for Web Access based on the following:
 - Name: **Web-Access**
 - Policy#1:
 - Name: **HTTP**
 - Ethertype: **IP**
 - Protocol: **TCP**
 - Destination Port Range: **HTTP To HTTP**
 - Policy#2:
 - Name: **HTTPS**
 - Ethertype: **IP**
 - Protocol: **TCP**
 - Destination Port Range: **HTTPS To HTTPS**

Task 2 – Create a Filter for PING

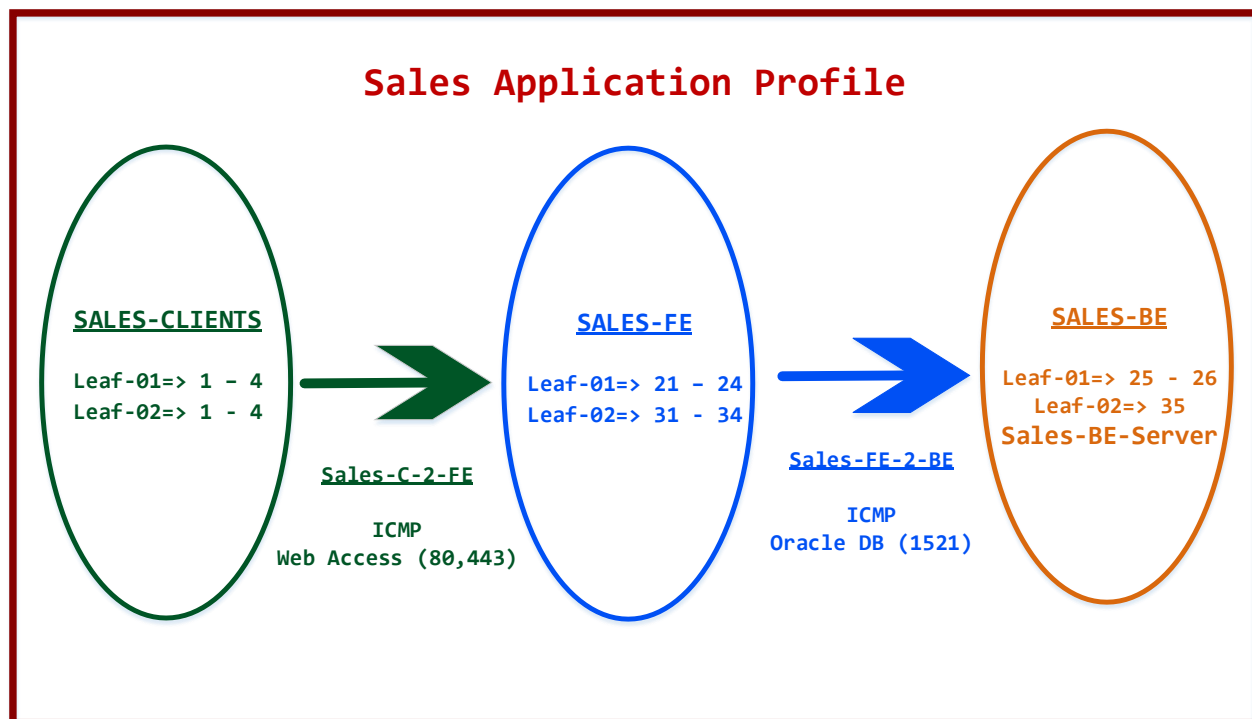
- Click **Tenant -> KBITS -> Security Policies -> Filters -> Create**
- Create a Filter for PING based on the following:
 - Name: **ICMP-PING**
 - Policy#1:
 - Name: **PING**
 - Ethertype: **IP**
 - Protocol: **ICMP**

Task 3 – Create a Filter for Oracle DB Access

- Click **Tenant -> KBITS -> Security Policies -> Filters -> Create**
- Create a Filter for Oracle DB Access based on the following:
 - Name: **ORACLE-DB-ACCESS**
 - Policy#1:
 - Name: **ORACLE-DB**
 - Ethertype: **IP**
 - Protocol: **TCP**
 - Destination Port Range: **1521 To 1521**

Lab 27 – Application Provisioning – Creating Contracts based on Sales Application Profile

Sales Application



Application Provisioning – Creating Contracts

Task 1 – Create a Contract for traffic from SALES-CLIENTS EPG towards SALES-FE EPG

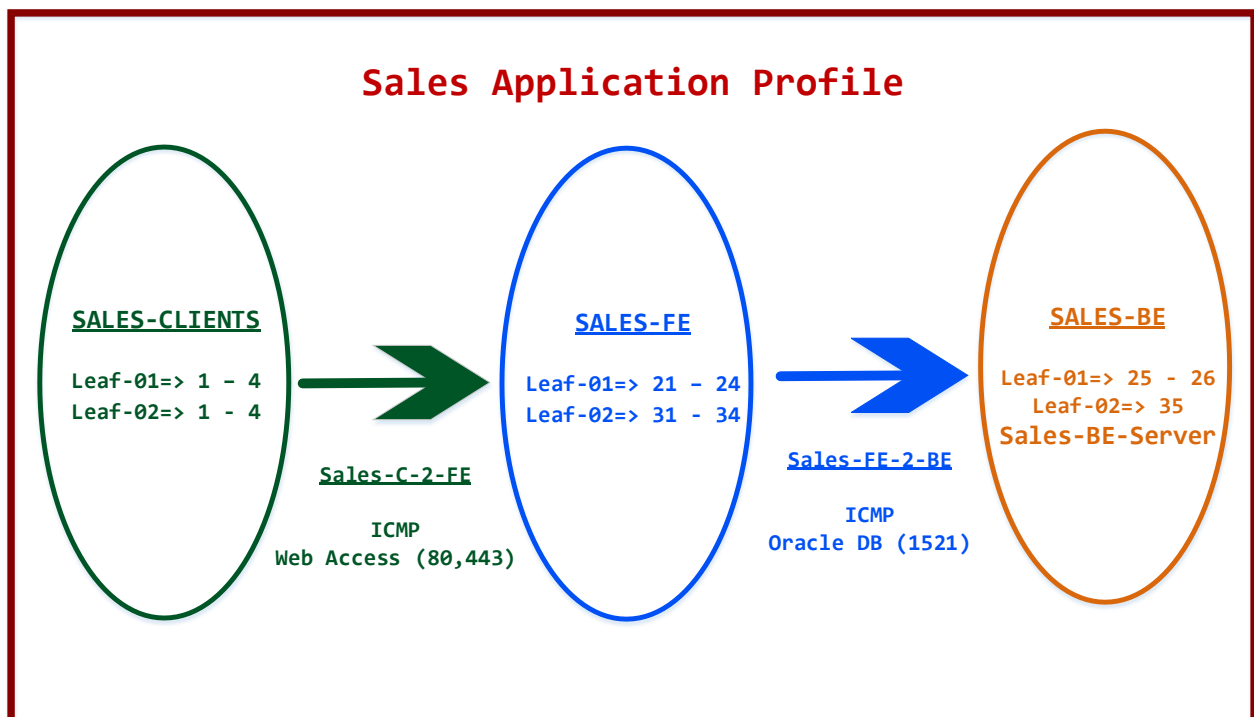
- Click **Tenant -> KBITS -> Security Policies -> Contracts -> Create**
- Create a Contract allowing Access from the SALES-CLIENTS EPG towards the SALES-FE EPG based on the following:
 - Contract Name: **SALES-C-2-FE**
 - Subject Name: **SALES-C-2-FE**
 - Filters:
 - Name: **KBITS/Web-Access**
 - Name: **KBITS/ICMP-PING**

Task 2 – Create a Contract for traffic from SALES-FE EPG towards SALES-BE EPG

- Click **Tenant -> KBITS -> Security Policies -> Contracts -> Create**
- Create a Contract allowing Access from the SALES-FE EPG towards the SALES-BE EPG based on the following:
 - Contract Name: **SALES-FE-2-BE**
 - Subject Name: **SALES-FE-2-BE**
 - Filters:
 - Name: **KBITS/ORACLE-DB-ACCESS**
 - Name: **KBITS/ICMP-PING**

Lab 28 – Application Provisioning – Provisioning Contracts based on Sales Application Profile

Sales Application



Application Provisioning – Provisioning Contracts

Task 1 – Provisioning the SALES-C-2-FE contract for the SALES-CLIENT EPG

- Click **Tenant -> KBITS -> Application Profiles -> SALES-APPLICATION-PROFILE -> Application EPGs -> SALES-CLIENTS -> Contracts**
- Provision the SALES-C-2-FE contract as a Consumed Contract.
 - Contract Name: **SALES-C-2-FE**
 - Provision type: **Consumed**

Task 2 – Provisioning the SALES-C-2-FE contract for the SALES-FE EPG

- Click **Tenant -> KBITS -> Application Profiles -> SALES-APPLICATION-PROFILE -> Application EPGs -> SALES-FE -> Contracts**
- Provision the SALES-C-2-FE contract as a Provided Contract.
 - Contract Name: **SALES-C-2-FE**
 - Provision type: **Provided**

Task 3 – Provisioning the SALES-FE-2-BE contract for the SALES-FE EPG

- Click **Tenant -> KBITS -> Application Profiles -> SALES-APPLICATION-PROFILE -> Application EPGs -> SALES-FE -> Contracts**
- Provision the SALES-FE-2-BE contract as a Consumed Contract.
 - Contract Name: **SALES-FE-2-BE**
 - Provision type: **Consumed**

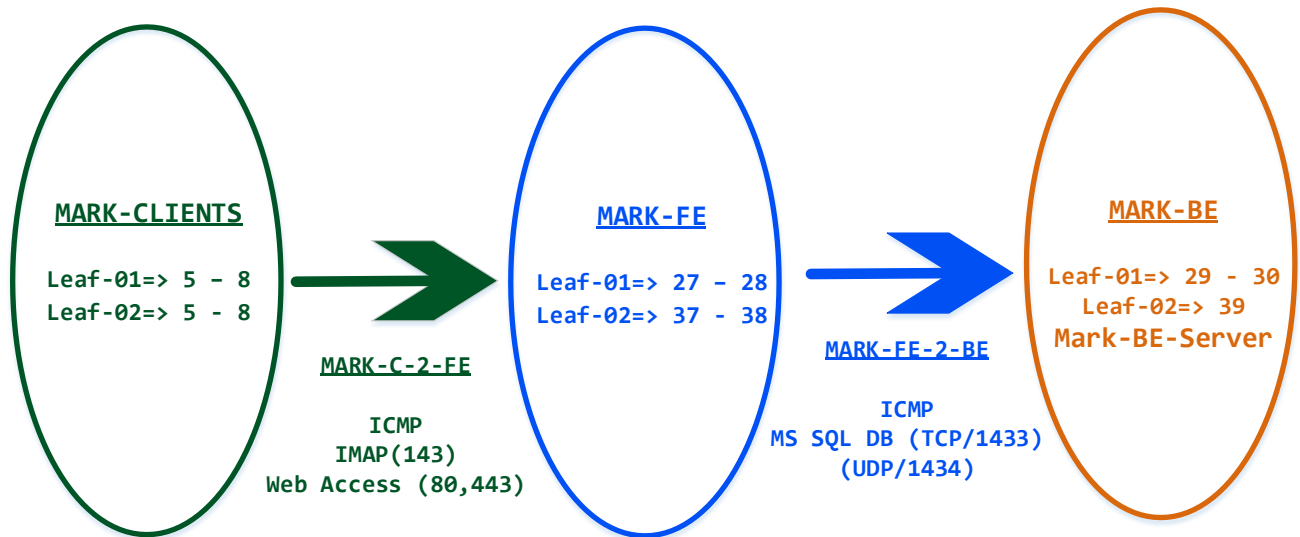
Task 4 – Provisioning the SALES-FE-2-BE contract for the SALES-BE EPG

- Click **Tenant -> KBITS -> Application Profiles -> SALES-APPLICATION-PROFILE -> Application EPGs -> SALES-BE -> Contracts**
- Provision the SALES-FE-2-BE contract as a Provided Contract.
 - Contract Name: **SALES-FE-2-BE**
 - Provision type: **Provided**

Lab 29 – Application Provisioning – Creating Application Profile and EPGs for Mark

Mark Application

MARK Application Profile



Application Provisioning – Creating an Application Profile

Note: The Application Provisioning labs are based on the Successful completion of Lab 23.

Task 1 – Create an Application Profile

- Click **Tenant -> KBITS -> Application Profiles -> Create**
- Create an Application Profile based on the following:
 - Name: **MARK-APPS**

Task 2 – Create EndPoint Groups (EPGs)

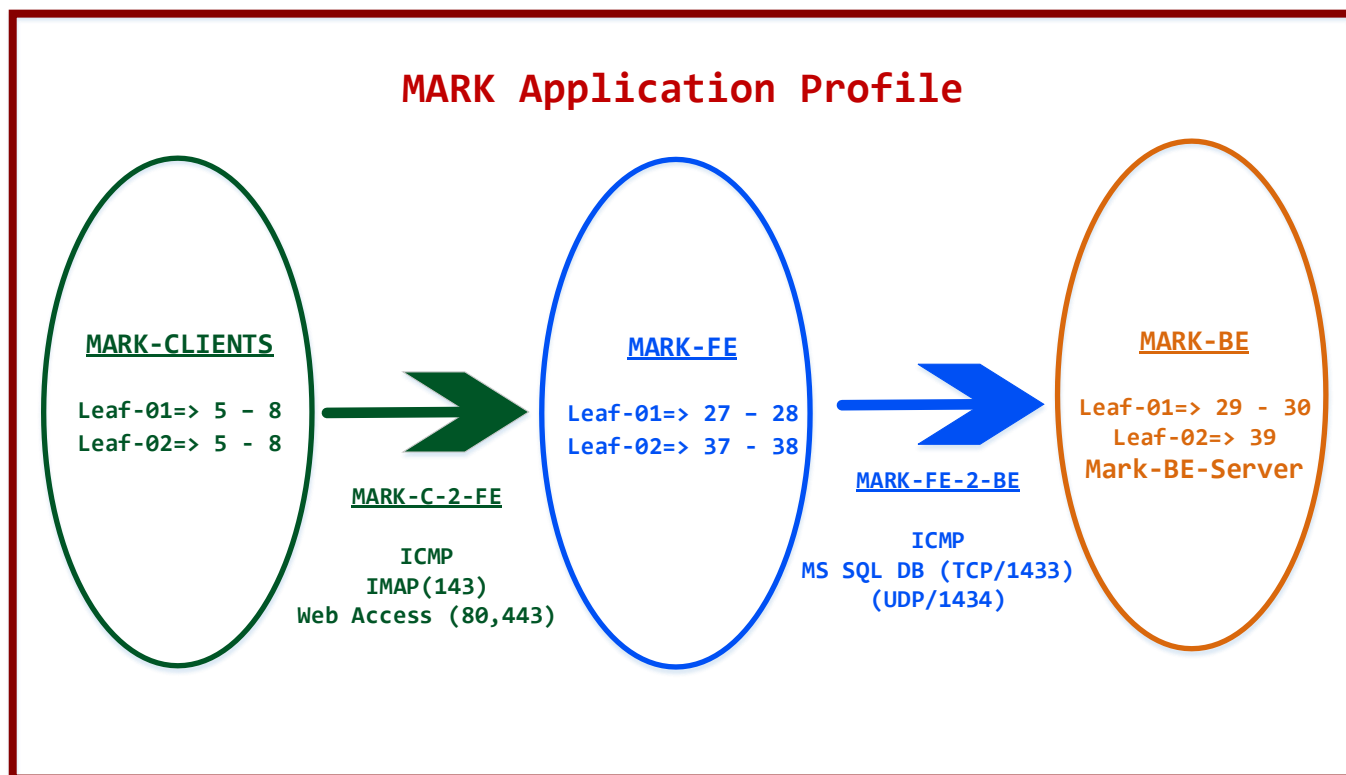
- Create EPGs based on the following:
 - Name: **MARK-CLIENTS**
 - Bridge domain: **BD1**

 - Name: **MARK-FE**
 - Bridge domain: **BD1**

 - Name: **MARK-BE**
 - Bridge domain: **BD1**
- Click **Tenant -> KBITS -> Application Profiles -> MARK-APPLICATION-PROFILE -> Application EPGs -> Create**
- Create 3 EPGs based on the information above.

Lab 30 – Application Provisioning – Assign Ports to EPGs in the Mark Application Profile

Mark Application



Application Provisioning – Port Assignments

Task 1 – Assign ports to the “MARK Client” EPGs

- Click **Tenant -> KBITS -> Application Profiles -> MARK-APPLICATION-PROFILE -> Application EPGs -> MARK-CLIENTS -> Static Ports**
- Assign Ports to the **MARK-CLIENT** EPG based on the following:

Port	VLAN	Port-Type	Deployment
LEAF-01 – 1 /5	40	Access	Immediate
LEAF-01 – 1 /6	40	Access	Immediate
LEAF-01 – 1 /7	40	Access	Immediate
LEAF-01 – 1 /8	40	Access	Immediate
LEAF-02 – 1 /5	40	Access	Immediate
LEAF-02 – 1 /6	40	Access	Immediate
LEAF-02 – 1 /7	40	Access	Immediate
LEAF-02 – 1 /8	40	Access	Immediate

Task 2 – Assign ports to the “MARK FE” EPGs

- Click **Tenant -> KBITS -> Application Profiles -> MARK-APPLICATION-PROFILE -> Application EPGs -> MARK-FE -> Static Ports**
- Assign Ports to the **MARK-FE** EPG based on the following:

Port	VLAN	Port-Type	Deployment
LEAF-01 – 1 /27	50	Trunk	Immediate
LEAF-01 – 1 /28	50	Trunk	Immediate
LEAF-02 – 1 /37	50	Trunk	Immediate
LEAF-02 – 1 /38	50	Trunk	Immediate

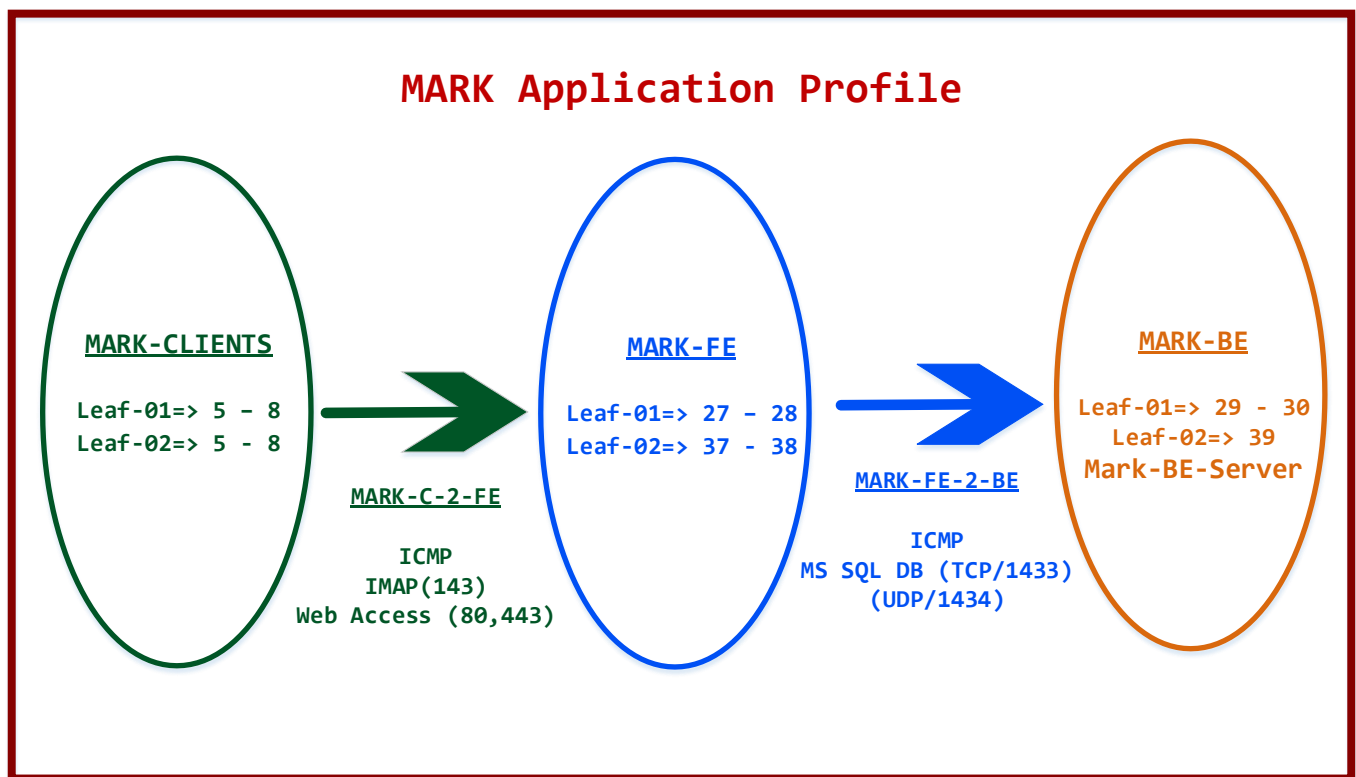
Task 3 – Assign ports to the “SALES BE” EPGs

- Click **Tenant -> KBITS -> Application Profiles -> MARK-APPLICATION-PROFILE -> Application EPGs -> MARK-BE -> Static Ports**
- Assign Ports to the **MARK-BE** EPG based on the following:

Port	VLAN	Port-Type	Deployment
LEAF-01 – 1 /29	60	Trunk	Immediate
LEAF-01 – 1 /30	60	Trunk	Immediate
LEAF-02 – 1 /39	60	Trunk	Immediate
MARK-BE-PC	60	Trunk	Immediate

Lab 31 – Application Provisioning – Creating Filters based on Mark Application

Mark Application



Application Provisioning – Creating Filters

Task 1 – Create a Filter for IMAP

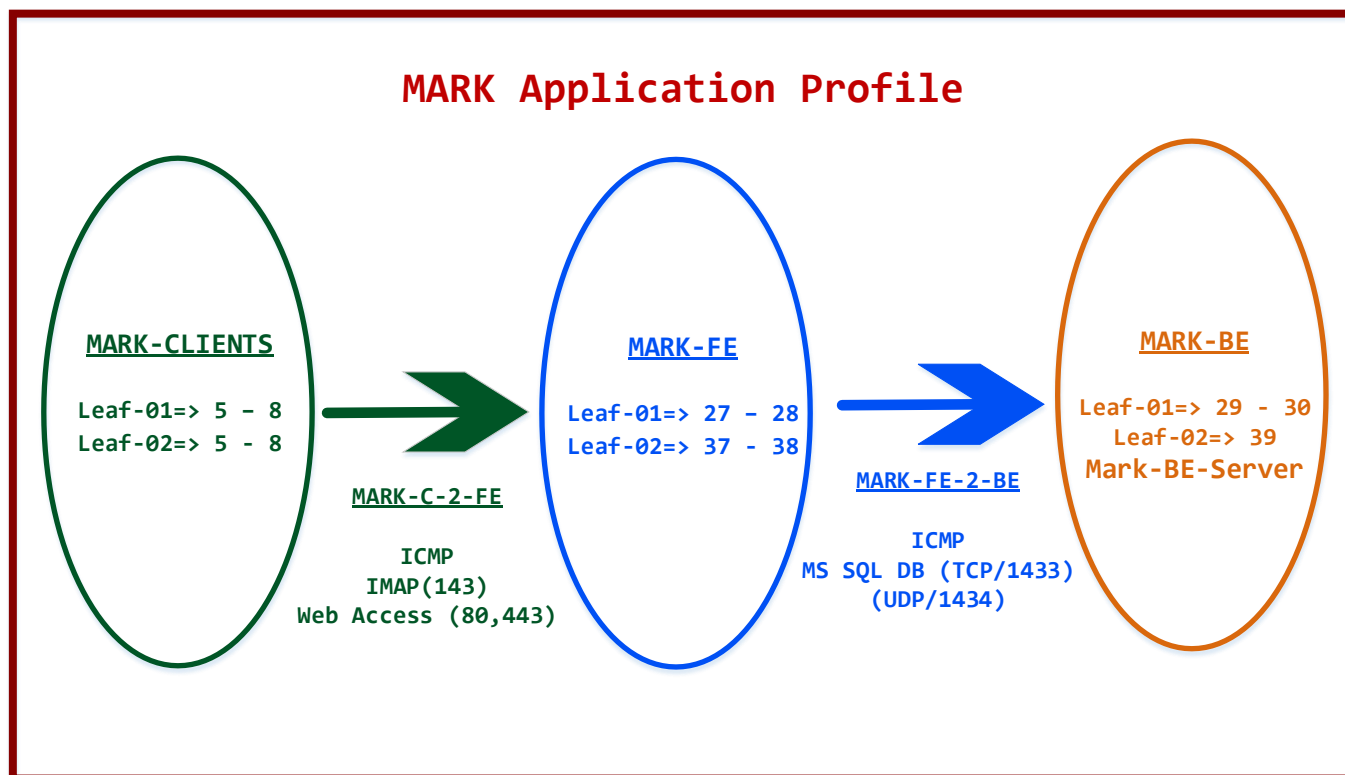
- Click **Tenant -> KBITS -> Security Policies -> Filters -> Create**
- Create a Filter for Web Access based on the following:
 - Name: **IMAP**
 - Policy#1:
 - Name: **IMAP4**
 - Ethertype: **IP**
 - Protocol: **TCP**
 - Destination Port Range: **143 To 143**

Task 2 – Create a Filter for MS SQL DB Access

- Click **Tenant -> KBITS -> Security Policies -> Filters -> Create**
- Create a Filter for Oracle DB Access based on the following:
 - Name: **MS-SQL-DB-ACCESS**
 - Policy#1:
 - Name: **MS-SQL-DB-TCP**
 - Ethertype: **IP**
 - Protocol: **TCP**
 - Destination Port Range: **1433 To 1433**
 - Policy#2:
 - Name: **MS-SQL-DB-UDP**
 - Ethertype: **IP**
 - Protocol: **UDP**
 - Destination Port Range: **1434 To 1434**

Lab 32 – Application Provisioning – Creating Contracts based on Mark Application Profile

Mark Application



Application Provisioning – Creating Contracts

Task 1 – Create a Contract for traffic from MARK-CLIENTS EPG towards MARK-FE EPG

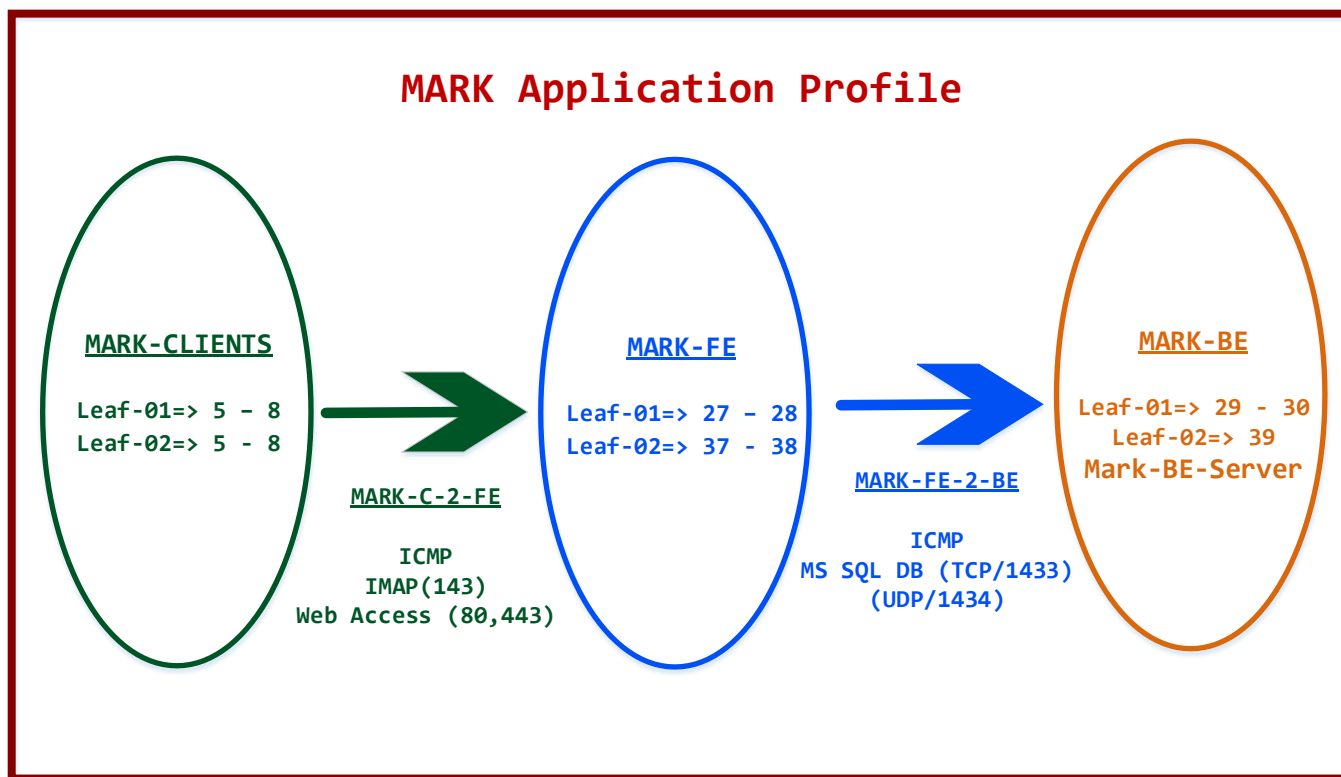
- Click **Tenant -> KBITS -> Security Policies -> Contracts -> Create**
- Create a Contract allowing Access from the MARK-CLIENTS EPG towards the MARK-FE EPG based on the following:
 - Contract Name: **MARK-C-2-FE**
 - Subject Name: **MARK-C-2-FE**
 - Filters:
 - Name: **KBITS/IMAP**
 - Name: **KBITS/Web-Access**
 - Name: **KBITS/ICMP-PING**

Task 2 – Create a Contract for traffic from MARK-FE EPG towards MARK-BE EPG

- Click **Tenant -> KBITS -> Security Policies -> Contracts -> Create**
- Create a Contract allowing Access from the MARK-FE EPG towards the MARK-BE EPG based on the following:
 - Contract Name: **MARK-FE-2-BE**
 - Subject Name: **MARK-FE-2-BE**
 - Filters:
 - Name: **KBITS/MS-SQL-DB-ACCESS**
 - Name: **KBITS/ICMP-PING**

Lab 33 – Application Provisioning – Provisioning Contracts based on Mark Application Profile

Mark Application



Application Provisioning – Provisioning Contracts

Task 1 – Provisioning the MARK-C-2-FE contract for the MARK-CLIENT EPG

- Click **Tenant -> KBITS -> Application Profiles -> MARK-APPLICATION-PROFILE -> Application EPGs -> MARK-CLIENTS -> Contracts**
- Provision the MARK-C-2-FE contract as a Consumed Contract.
 - Contract Name: **MARK-C-2-FE**
 - Provision type: **Consumed**

Task 2 – Provisioning the MARK-C-2-FE contract for the MARK-FE EPG

- Click **Tenant -> KBITS -> Application Profiles -> MARK-APPLICATION-PROFILE -> Application EPGs -> MARK-FE -> Contracts**
- Provision the MARK-C-2-FE contract as a Provided Contract.
 - Contract Name: **MARK-C-2-FE**
 - Provision type: **Provided**

Task 3 – Provisioning the MARK-FE-2-BE contract for the MARK-FE EPG

- Click **Tenant -> KBITS -> Application Profiles -> MARK-APPLICATION-PROFILE -> Application EPGs -> MARK-FE -> Contracts**
- Provision the MARK-FE-2-BE contract as a Consumed Contract.
 - Contract Name: **MARK-FE-2-BE**
 - Provision type: **Consumed**

Task 4 – Provisioning the MARK-FE-2-BE contract for the MARK-BE EPG

- Click **Tenant -> KBITS -> Application Profiles -> MARK-APPLICATION-PROFILE -> Application EPGs -> MARK-BE -> Contracts**
- Provision the MARK-FE-2-BE contract as a Provided Contract.
 - Contract Name: **MARK-FE-2-BE**
 - Provision type: **Provided**

Implementing ACI

Authored By:

Khawar Butt

CCIE # 12353

Hepta CCIE#12353

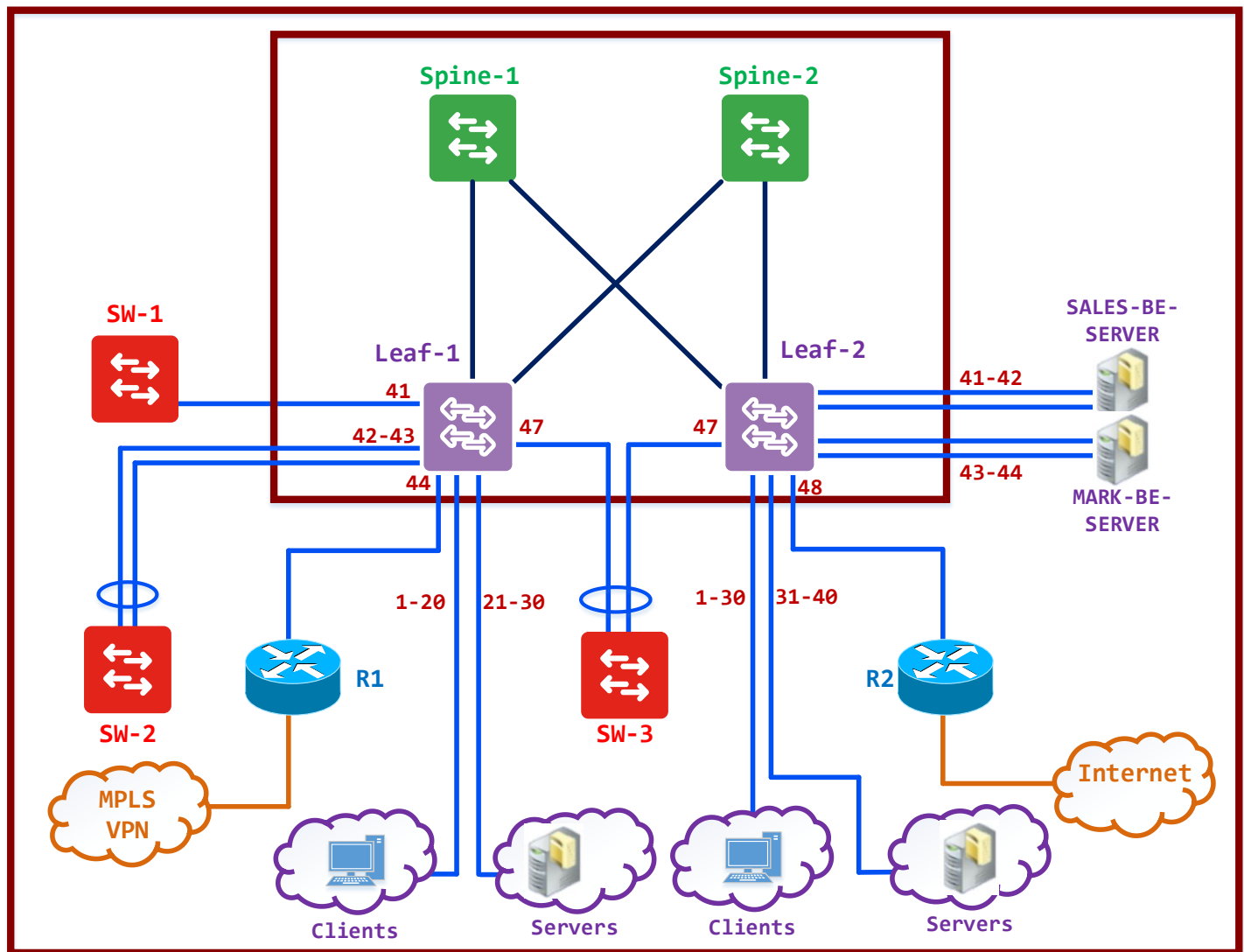
CCDE # 20110020

**External Domains - L2OUT &
L3OUT**



Lab 34 – Configuring L2OUT – External Bridged Outside

Physical Topology



Configuring L2OUT

Note: The External Domain Labs are based on the successful completion of upto and including Lab 33.

- The VLAN 10 & 20 are stretched between ACI & Non-ACI Domains.
- Devices connected to VLAN 10 are located on Non-ACI Switches SW1 & SW2. Sales Clients are allocated to this VLAN.
- Devices connected to VLAN 20 are located on Non-ACI Switches SW2 & SW3. Sales FE are allocated to this VLAN.

Task 1 – Configure a L2OUT – VLAN 10

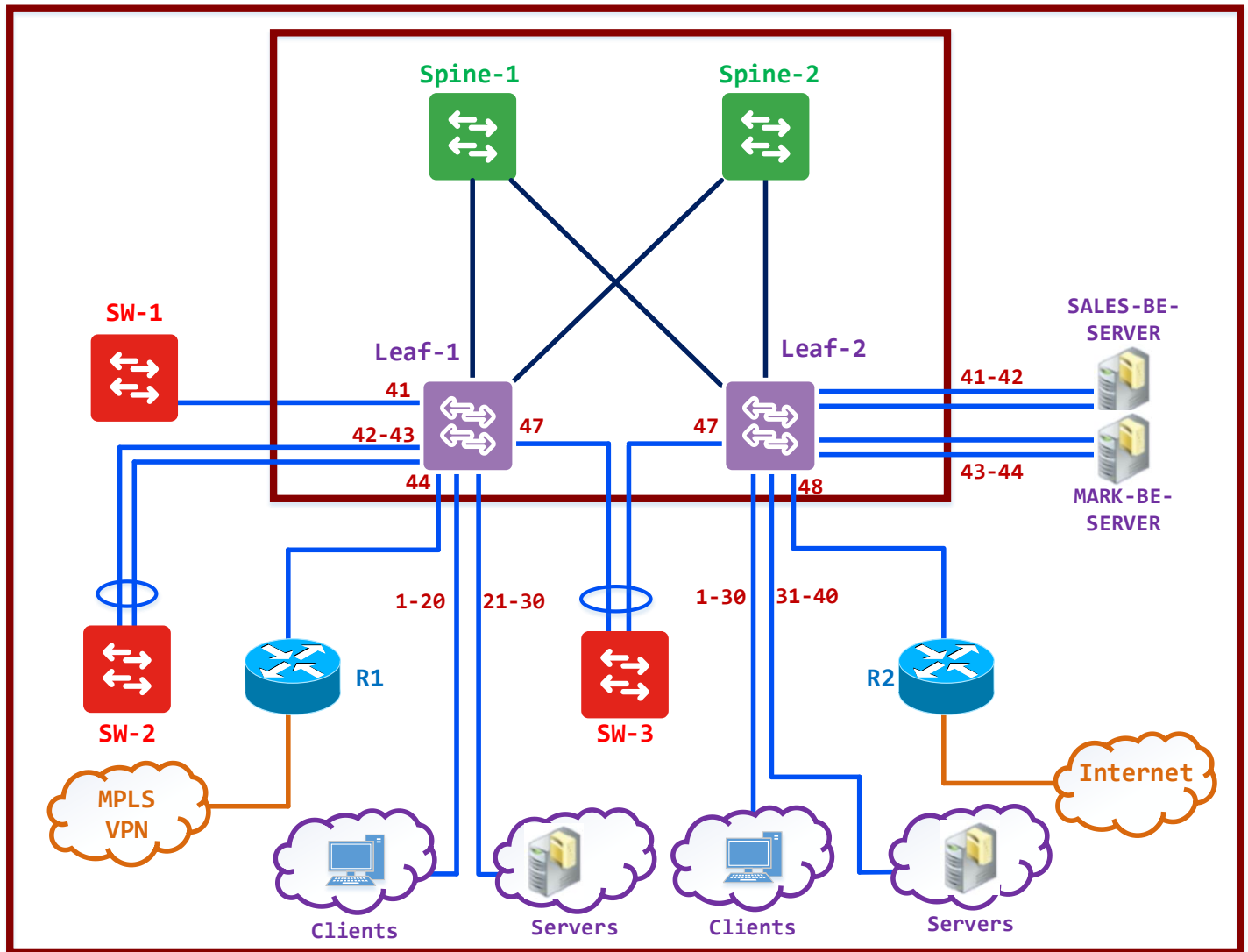
- Click **Tenant -> ABC -> Networking -> External Bridge Networks**
- Configure a Bridge Outside based on the following:
 - Name: **L2OUT-SALES-CLIENTS-VLAN-10**
 - External Bridge Domain: **EXT-L2-PORTS**
 - Bridge Domain: **BD1**
 - VLAN: **10**
 - External L2 Connection:
 - Port: **Leaf-1 - 101/1/41**
 - PC: **IPG-SW2-PC**
 - External L2OUT Network EPG: **L2OUT-SALES-CLIENTS**

Task 2 – Configure a L2OUT – VLAN 20

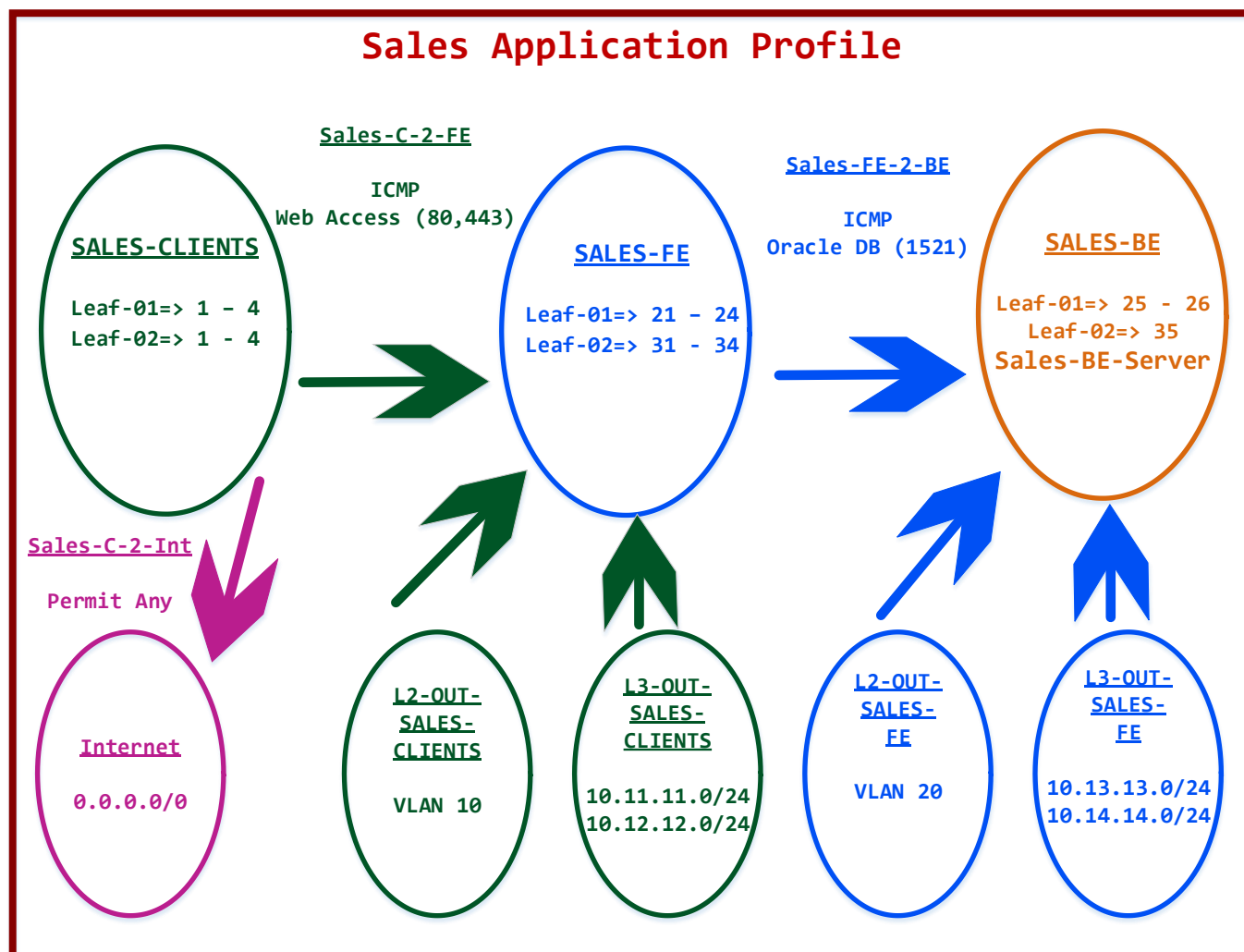
- Click **Tenant -> ABC -> Networking -> External Bridge Networks**
- Configure a Bridge Outside based on the following:
 - Name: **L2OUT-SALES-CLIENTS-VLAN-20**
 - External Bridge Domain: **EXT-L2-PORTS**
 - Bridge Domain: **BD1**
 - VLAN: **20**
 - External L2 Connection:
 - PC: **IPG-SW2-PC**
 - vPC: **IPG-SW3-vPC**
 - External L2OUT Network EPG: **L2OUT-SALES-FE**

Lab 35 - Configuring L2OUT - Provisioning Contracts

Physical Topology



Logical Topology



L2OUT Provisioning Contracts

Task 1 – Provisioning the SALES-C-2-FE contract for the L2-OUT-SALES-CLIENTS EPG

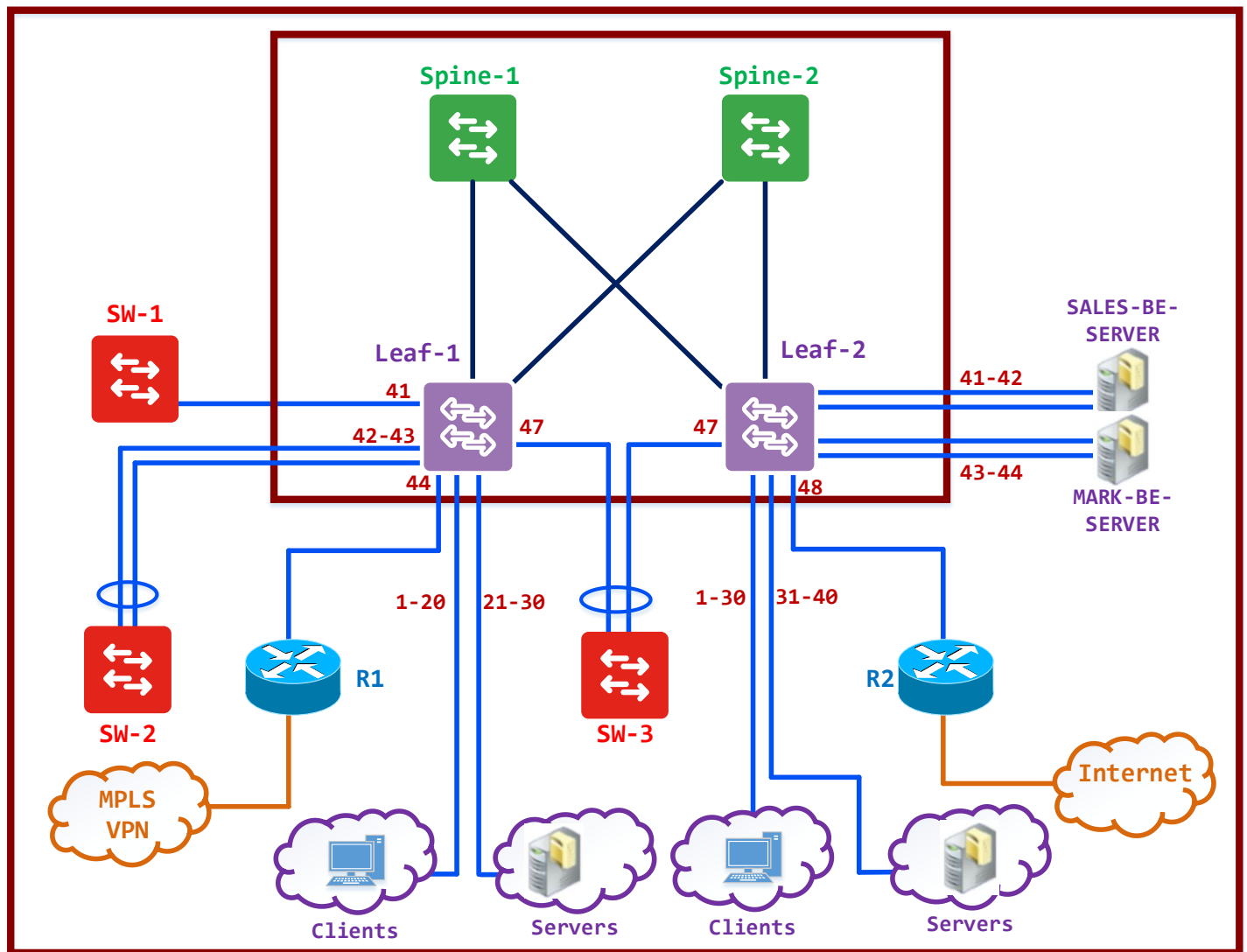
- Click **Tenant -> ABC -> Networking -> External Bridge Networks -> L2OUT-SALES-CLIENTS-VLAN-10 -> Networks -> SALES-CLIENTS-L2OUT**
- Provision the SALES-C-2-FE contract as a Consumed Contract.
 - Contract Name: **SALES-C-2-FE**
 - Provision type: **Consumed**

Task 2 – Provisioning the SALES-FE-2-BE contract for the L2-OUT-SALES-FE EPG

- Click **Tenant -> ABC -> Networking -> External Bridge Networks -> L2OUT-SALES-FE-VLAN-20 -> Networks -> SALES-FE-L2OUT**
- Provision the SALES-FE-2-BE contract as a Consumed Contract.
 - Contract Name: **SALES-FE-2-BE**
 - Provision type: **Consumed**
- Provision the SALES-C-2-FE contract as a Provisioned Contract.
 - Contract Name: **SALES-C-2-FE**
 - Provision type: **Provided**

Lab 36 – Configuring L3OUT – Configuring MP-BGP in the Fabric

Physical Topology



Task 1 – Configure the Fabric for MP-BGP

- Click **Fabric -> Fabric Policies -> Pod Policies -> Policies -> BGP Route Reflector Default**
- Configure the Policy based on the following:
 - AS: 65001
 - Route Reflectors: Spine1(103) & Spine2(104)
- Click **Submit**.

Task 2 – Configure a POD Policy Group

- The Policy Group links to the Default BGP Route Reflector Policy.
- Click **Fabric -> Fabric Policies -> Pod Policies -> Policy Group -> New**
- Configure the Policy Group based on the following:
 - Name: MY-POD-POLICY-GROUP
 - BGP Route Reflector Policy: default

Task 3 – Configure a POD Profile

- The Profile links to the POD Policy Group created in the previous step.
- Click **Fabric -> Fabric Policies -> Pod Policies -> Profiles -> Pod Profile Default -> default**
- Configure the Fabric Policy Group as **MY-POD-POLICY-GROUP**

Task 1 – Configure the L3OUT using EIGRP

- Click **Tenant -> KBITS -> Networking -> External Routed Network -> Create New**
- Configure EIGRP using the following parameters:

Main Page:

Name: **L3OUT-EIGRP**
Protocol: **EIGRP**
AS # : **111**
VRF: **GRT**
External Routed Domain: **EXT-L3-PORTS**

Node Profile:

Name: **LEAF-01-EIGRP**
LEAF-1 - Node ID : **101**
Router-ID: **11.11.11.11**

Interface Profile:

Name: **L3OUT-EIGRP**
EIGRP Policy: **default**
Routed Interface: **Leaf-01/1/44**
IP Address: **192.1.100.11/24**

EPG:

Name: **L3OUT-SALES-CLIENTS**
Networks: 10.11.11.0/24 & 10.12.12.0/24

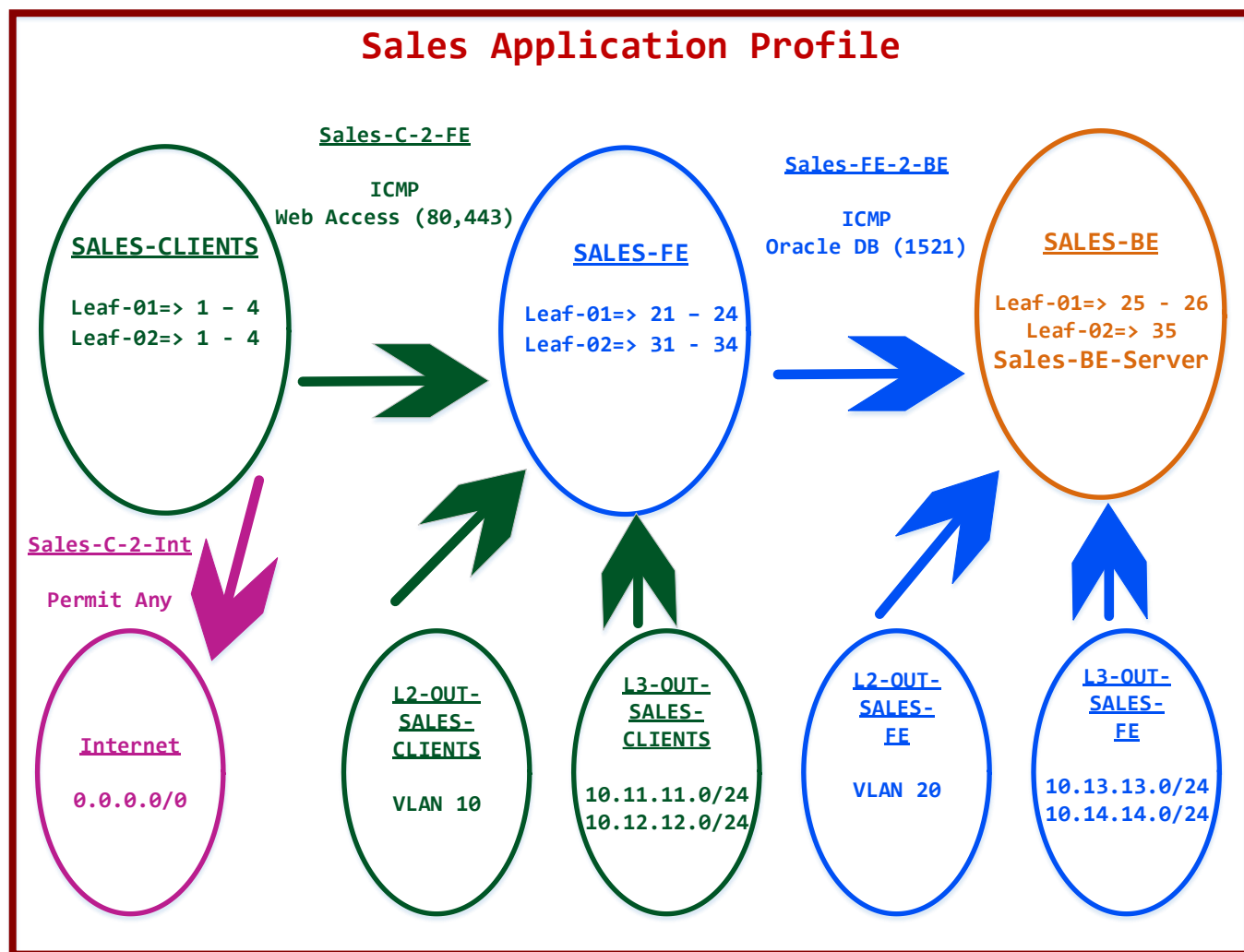
Name: **L3OUT-SALES-FE**
Networks: 10.13.13.0/24 & 10.14.14.0/24

- Click **Submit**.

Task 2 – Associating the L3OUT with the Bridge Domain

- Click **Tenant -> KBITS -> Networking -> Bridge Domains -> BD1 -> L3 Configurations -> Associated L3OUT**
- **Select L3OUT-EIGRP** from the drop-down list and update.
- Click **Submit**.

Logical Topology



L3OUT Provisioning Contracts

Task 1 – Provisioning the SALES-C-2-FE contract for the L3-OUT-SALES-CLIENTS EPG

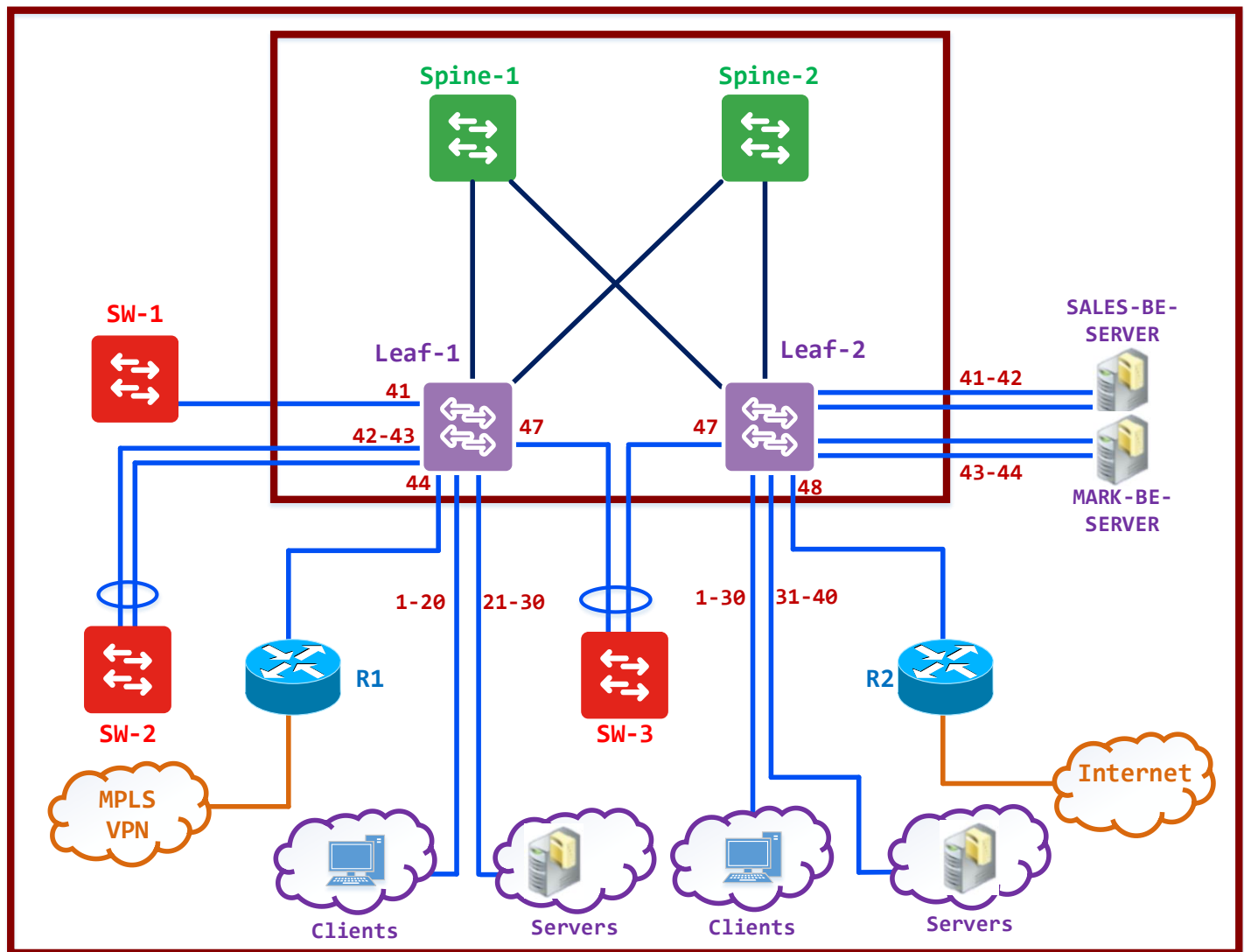
- Click **Tenant -> KBITS -> Networking -> External Routed Networks -> L3OUT-EIGRP -> Networks -> L3OUT-SALES-CLIENTS -> Contracts**
- Provision the SALES-C-2-FE contract as a Consumed Contract.
 - Contract Name: **SALES-C-2-FE**
 - Provision type: **Consumed**

Task 2 – Provisioning the SALES-FE-2-BE contract for the L3-OUT-SALES-FE EPG

- Click **Tenant -> KBITS -> Networking -> External Routed Networks -> L3OUT-EIGRP -> Networks -> L3OUT-SALES-FE -> Contracts**
- Provision the SALES-FE-2-BE contract as a Consumed Contract.
 - Contract Name: **SALES-FE-2-BE**
 - Provision type: **Consumed**
- Provision the SALES-C-2-FE contract as a Provisioned Contract.
 - Contract Name: **SALES-C-2-FE**
 - Provision type: **Provided**

Lab 39 – Configuring L3OUT – Configuring Routed Outside - OSPF

Physical Topology



Task 1 – Configure the L3OUT using OSPF

- Click **Tenant -> KBITS -> Networking -> External Routed Network -> Create New**
- Configure EIGRP using the following parameters:

Main Page:

Name: **L3OUT-OSPF**
Protocol: **OSPF**
Area # : **0**
Area Type: **Regular**
VRF: **GRT**
External Routed Domain: **EXT-L3-PORTS**

Node Profile:

Name: **LEAF-02-OSPF**
LEAF-1 - Node ID : **102**
Router-ID: **22.22.22.22**

Interface Profile:

Name: **L3OUT-OSPF**
OSPF Policy: **default**
Routed Interface: **Leaf-02/1/48**
IP Address: **192.1.200.22/24**

EPG:

Name: **Internet**
Networks: **0.0.0.0/0**

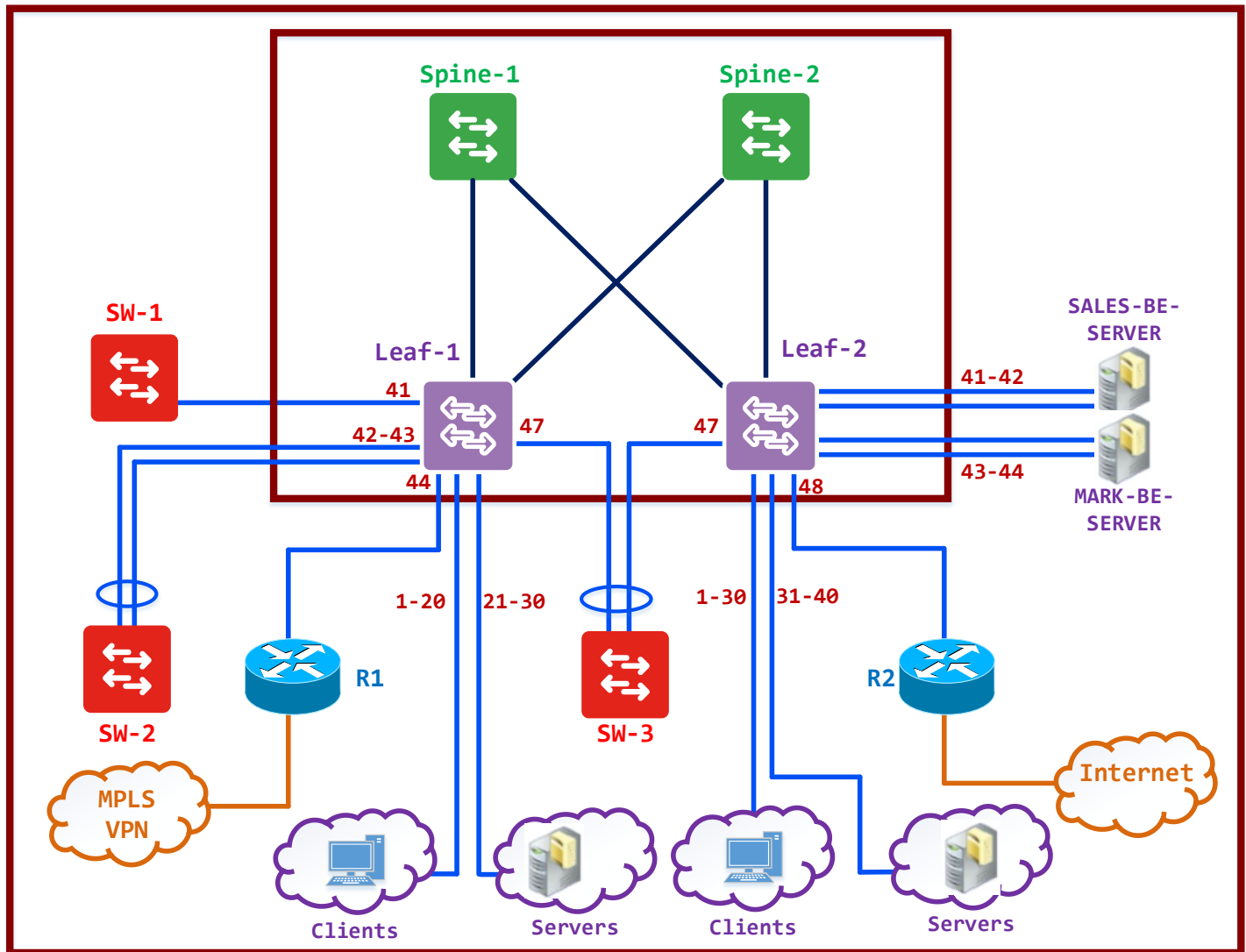
- Click **Submit**.

Task 2 – Associating the L3OUT with the Bridge Domain

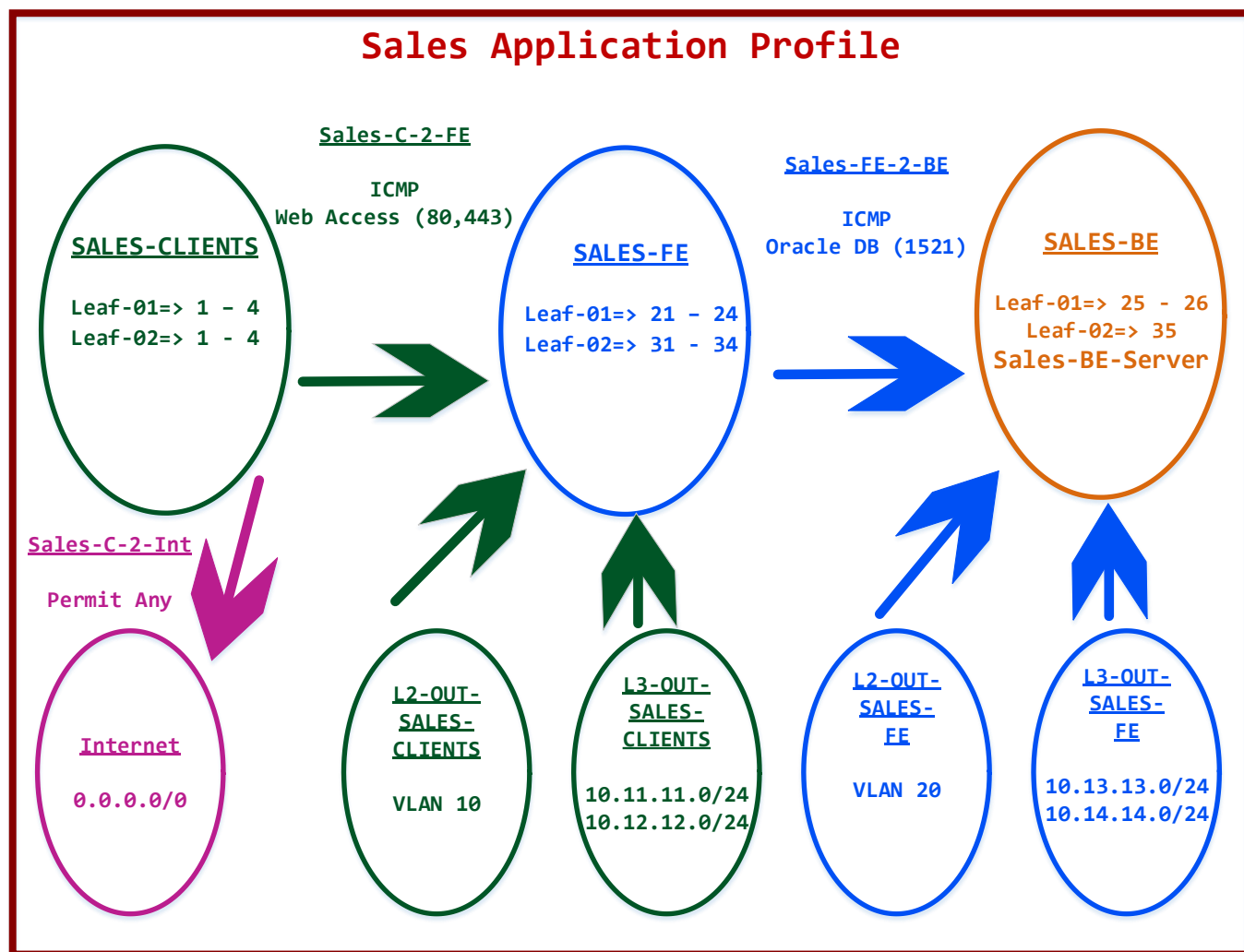
- Click **Tenant -> KBITS -> Networking -> Bridge Domains -> BD1 -> L3 Configurations -> Associated L3OUT**
- **Select L3OUT-OSPF** from the drop-down list and update.
- Click **Submit**.

Lab 40 – Configuring L3OUT – Provisioning Internet Contract

Physical Topology



Logical Topology



Creating Filters

Task 1 – Create a Filter for Internet

- Click **Tenant -> KBITS -> Security Policies -> Filters -> Create**
- Create a Filter for Web Access based on the following:
 - Name: **Internet**
 - Policy#1:
 - Name: **Internet**
 - Ethertype: **IP**
 - Protocol: **Any**
 - Destination Port Range: **Unspecified to Unspecified**

Creating Contracts

Task 1 – Create a Contract for traffic from SALES-CLIENTS EPG towards the Internet

- Click **Tenant -> KBITS -> Security Policies -> Contracts -> Create**
- Create a Contract allowing Access from the SALES-CLIENTS EPG towards the Internet based on the following:
 - Contract Name: **SALES-C-2-INT**
 - Subject Name: **SALES-C-2-INT**
 - Filters:
 - Name: **KBITS/Internet**

L3OUT Provisioning Contracts

Task 1 – Provisioning the SALES-C-2-INT contract for the L3-OUT-SALES-CLIENTS EPG

- Click **Tenant -> KBITS -> Networking -> External Routed Networks -> L3OUT-OSPF -> Networks -> Internet -> Contracts**
- Provision the SALES-C-2-INT contract as a Provided Contract.
 - Contract Name: **SALES-C-2-INT**
 - Provision type: **Provided**

Task 2 – Provisioning the SALES-C-2-INT contract for the SALES-CLIENTS EPG

- Click **Tenant -> KBITS -> Application Profiles -> SALES-APPLICATION-PROFILE -> Application EPGs -> SALES-CLIENTS -> Contracts**
- Provision the SALES-C-2-INT contract as a Consumed Contract.
 - Contract Name: **SALES-C-2-INT**
 - Provision type: **Consumed**