Project Name :VLAN and Inter-VLAN Routing with FortiGate

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VLAN Configuration Basics

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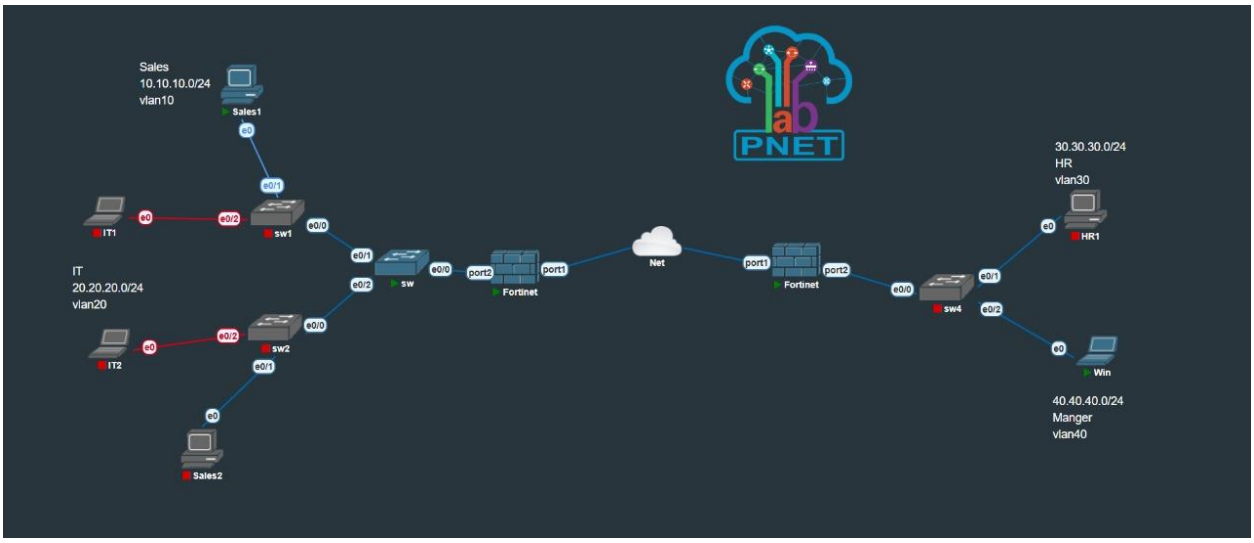
1. Network Topology Diagram



Explanation:
The topology consists of multiple switches connected to a FortiGate firewall for inter-VLAN routing.

- **VLAN10:** Sales (10.10.10.0/24)

- **VLAN20:** IT (20.20.20.0/24)
- **VLAN30:** HR (30.30.30.0/24)
- **VLAN40:** Manager (40.40.40.0/24)
  Switches SW1 and SW2 handle VLAN10 and VLAN20, while SW4 handles VLAN30 and VLAN40. FortiGate acts as the Layer 3 device for routing between VLANs.

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2. IP/VLAN Plan

VLAN	Subnet	Department
10	10.10.10.0/24	Sales
20	20.20.20.0/24	IT
30	30.30.30.0/24	HR
40	40.40.40.0/24	Manager

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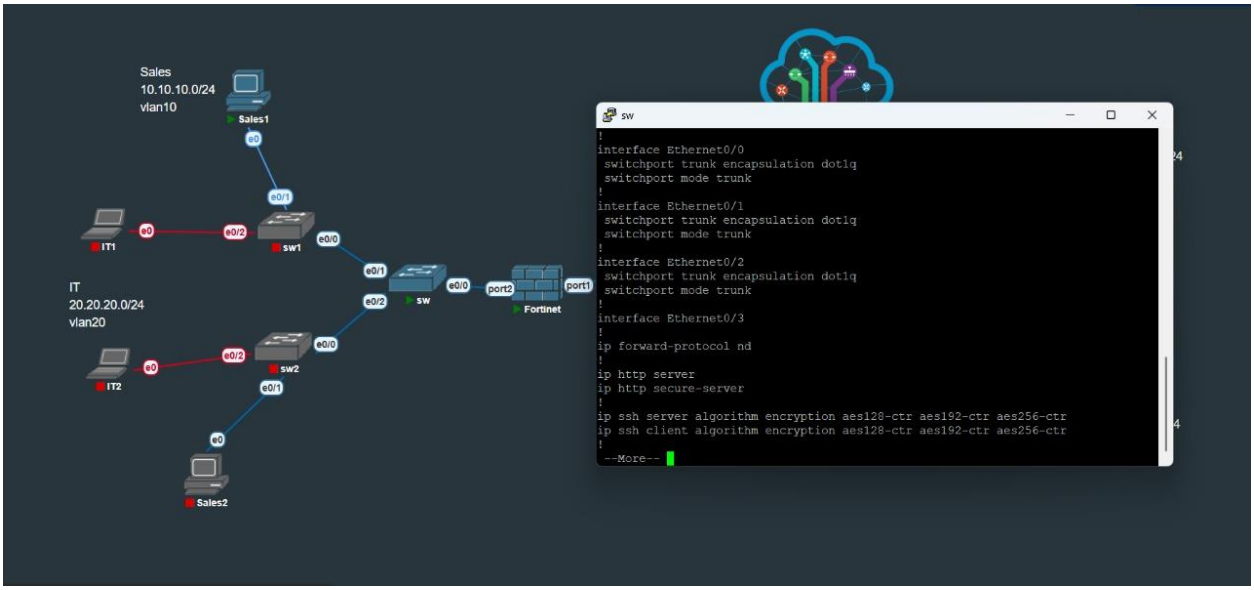
3. Detailed Screenshots with Technical Explanation

Screenshot 1: Switch Trunk Configuration



Technical Explanation:

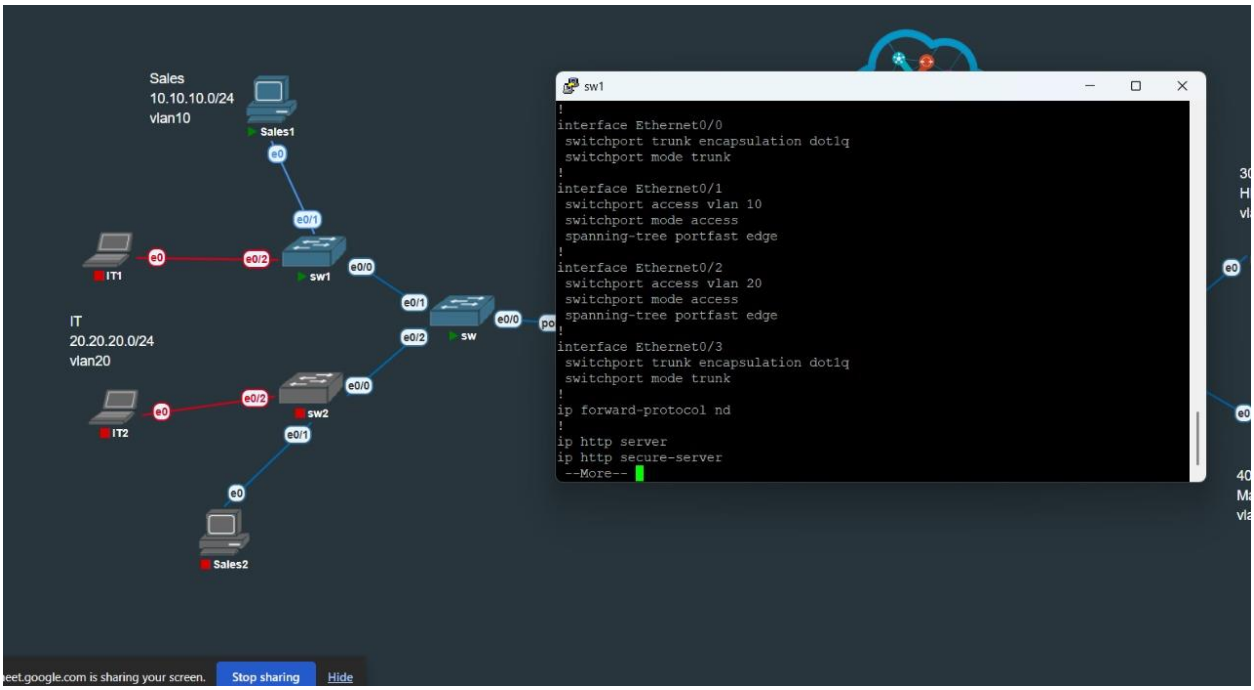
- Interfaces e0/0, e0/1, e0/2, and e0/3 are configured with switchport trunk encapsulation dot1q and switchport mode trunk.
- This ensures VLAN tagging for communication with FortiGate.
  Key Observations:
- Trunk ports allow multiple VLANs to pass through a single physical link.
- Dot1q encapsulation is used for VLAN tagging.

Screenshot 2: VLAN Database

Technical Explanation:

- VLAN10 and VLAN20 are active.
- Ports assigned include e0/3 as trunk.
- Confirms VLAN creation and operational status.

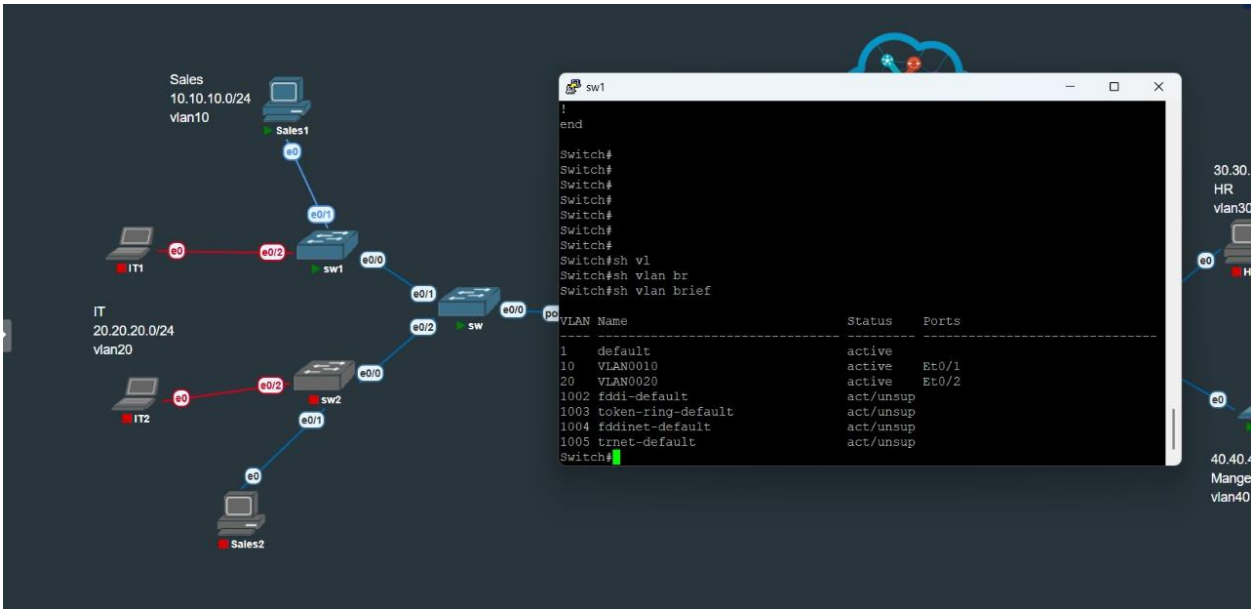
Screenshot 3: SW1 VLAN Brief



Technical Explanation:

- VLAN10 and VLAN20 active.
- Ports e0/1 and e0/2 configured as access ports for Sales and IT PCs respectively.

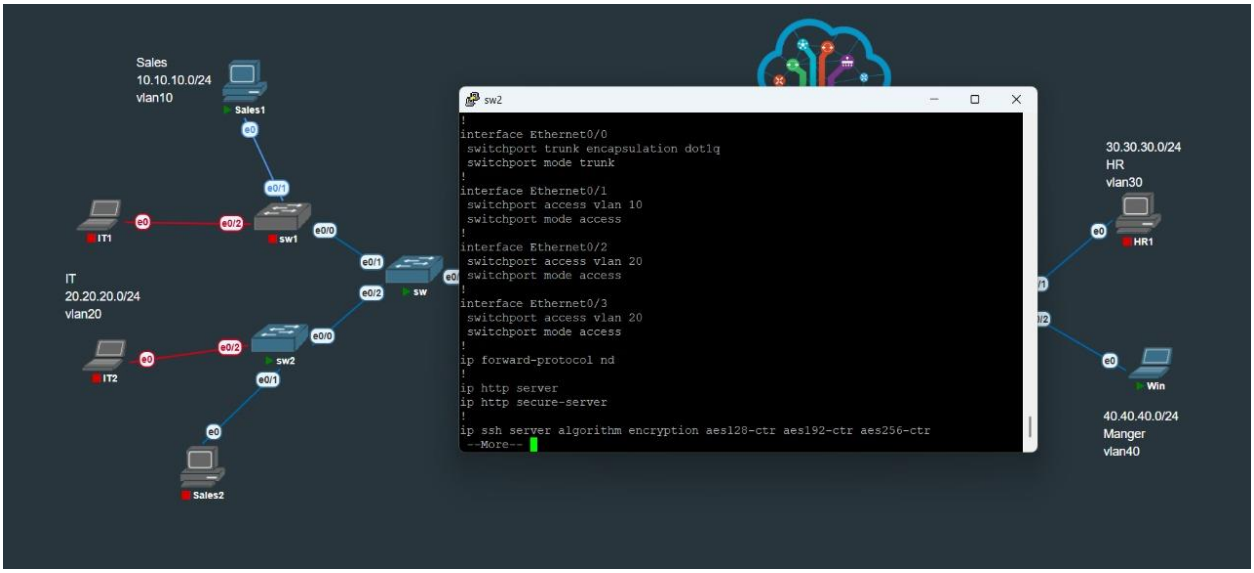
Screenshot 4: SW2 VLAN Brief



Technical Explanation:

- VLAN10 and VLAN20 active.
- Ports e0/2 and e0/3 assigned for IT and Sales devices.

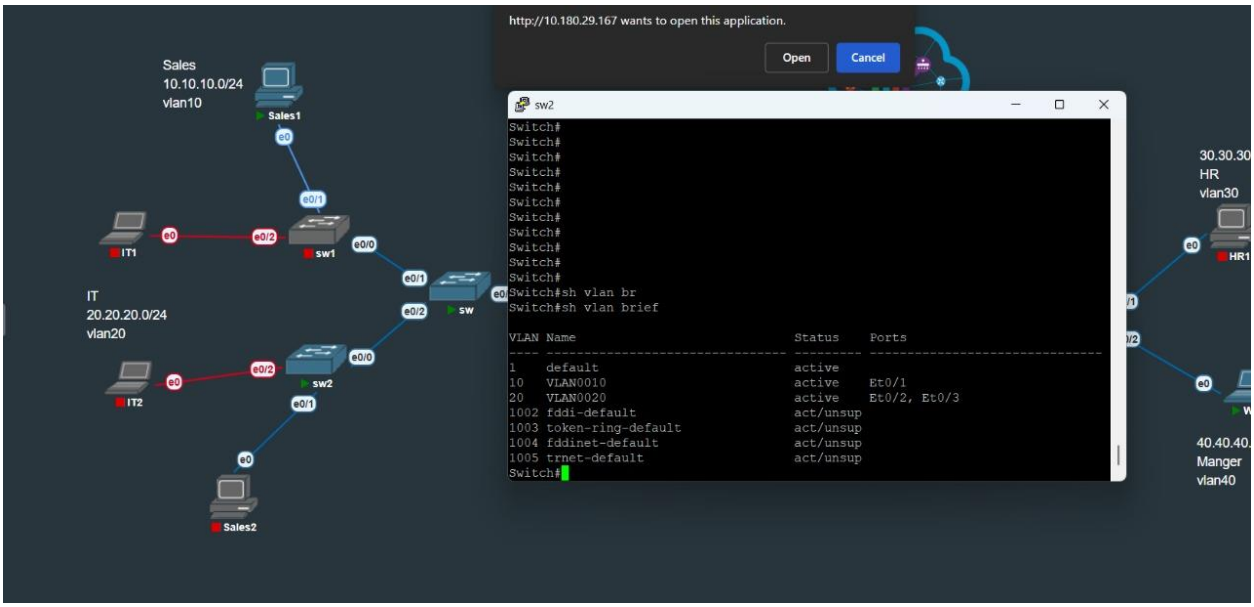
Screenshot 5: SW4 VLAN Brief



Technical Explanation:

- VLAN30 and VLAN40 active.
- Ports e0/1 and e0/2 configured as access ports for HR and Manager PCs.

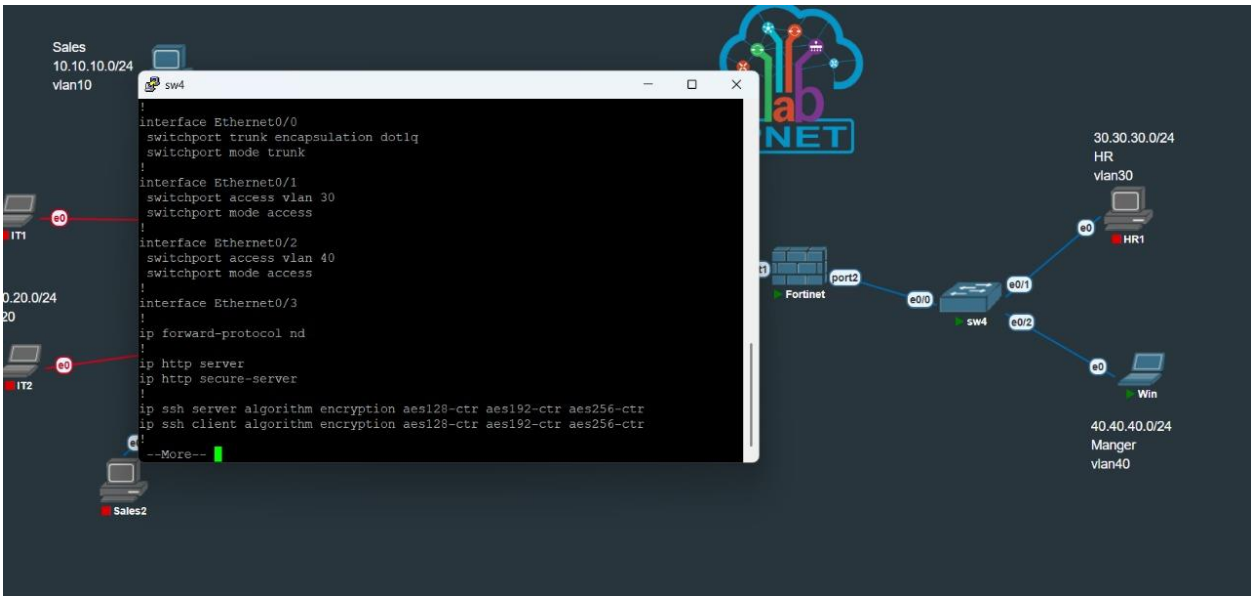
Screenshot 6: SW4 CLI Configuration



Technical Explanation:

- e0/0 trunk to FortiGate.
- e0/1 access VLAN30, e0/2 access VLAN40.
- Confirms correct VLAN assignment and uplink trunking.

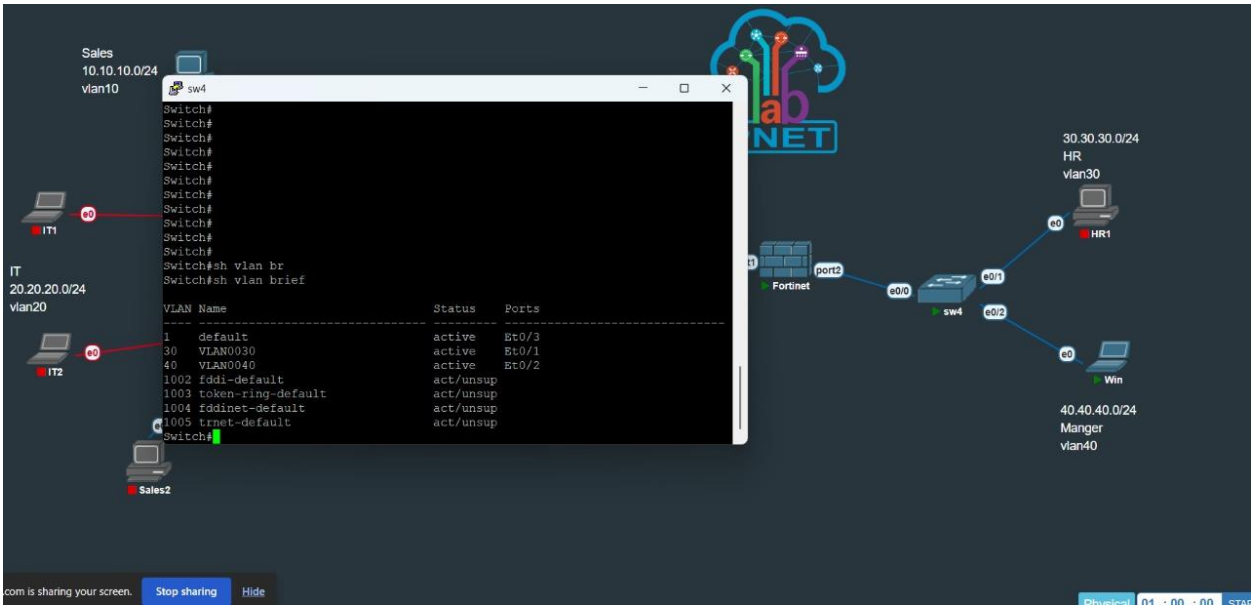
Screenshot 7: SW1 CLI Configuration



Technical Explanation:

- e0/0 trunk, e0/1 access VLAN10, e0/2 access VLAN20, e0/3 trunk.
- spanning-tree portfast edge applied to access ports for faster convergence.

Screenshot 8: SW2 CLI Configuration



Technical Explanation:

- e0/0 trunk, e0/1 access VLAN10, e0/2 access VLAN20.
- SSH and HTTP services enabled for remote management.

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4. CLI Configuration Examples

Example from SW1:

```
interface Ethernet0/0
 switchport trunk encapsulation dot1q
 switchport mode trunk
interface Ethernet0/1
 switchport access vlan 10
 switchport mode access
interface Ethernet0/2
 switchport access vlan 20
 switchport mode access
interface Ethernet0/3
 switchport trunk encapsulation dot1q
 switchport mode trunk
spanning-tree portfast edge
```

FortiGate Integration for VLANs

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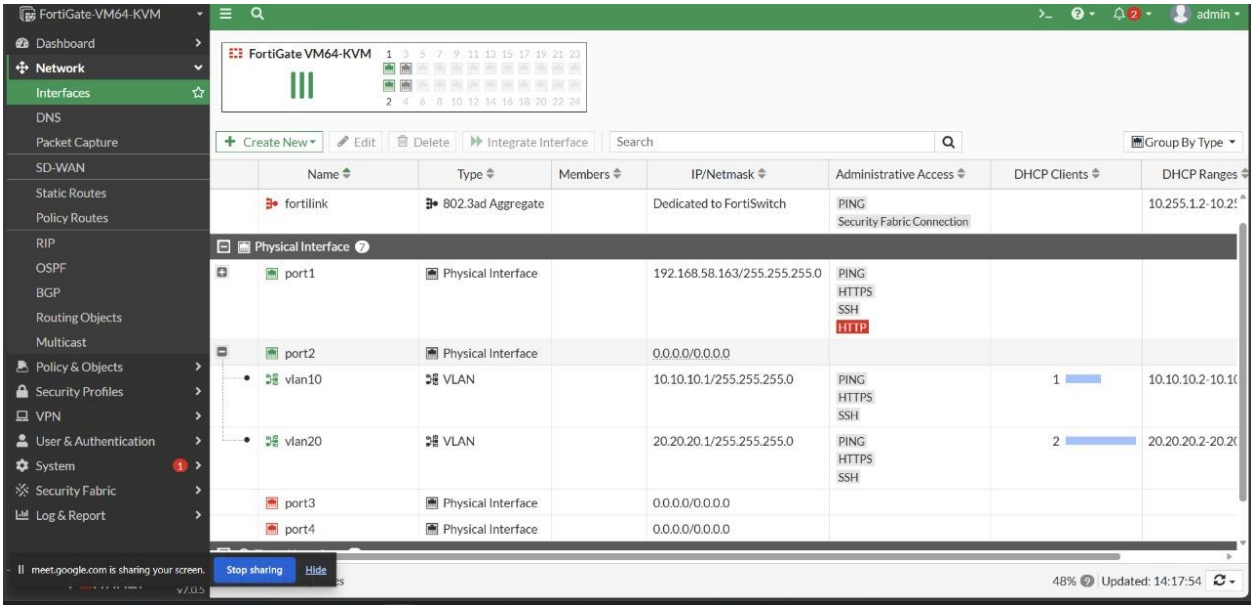
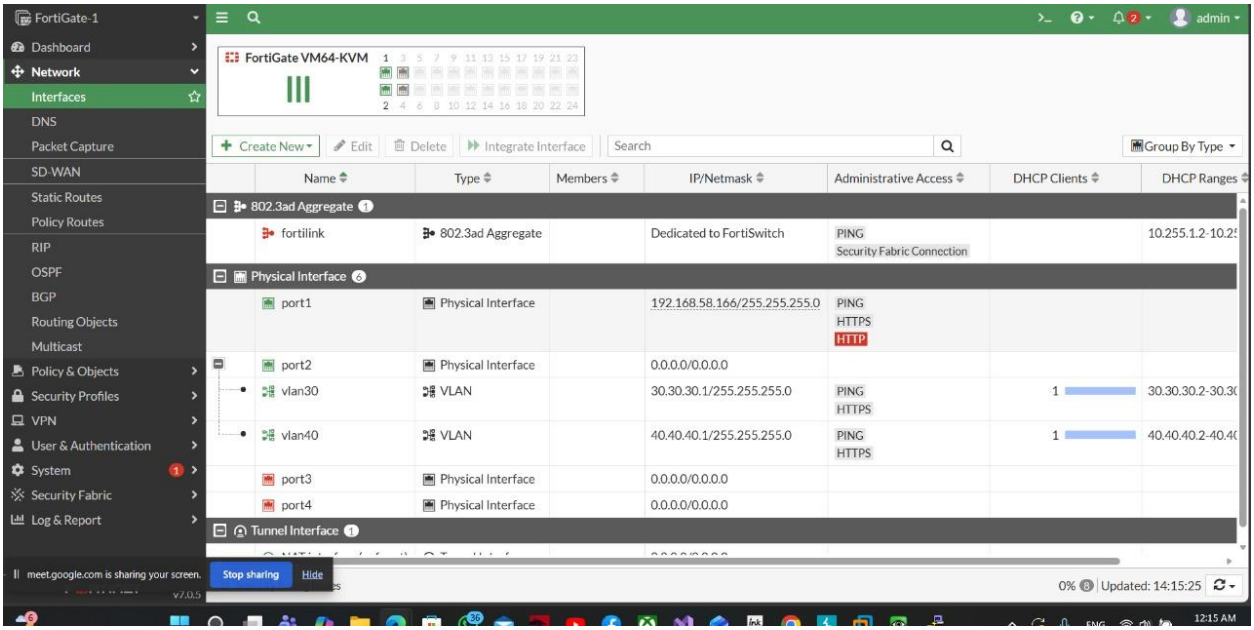
2. FortiGate Interface & VLAN Configuration



Technical Explanation:

- Physical interface port1 configured with IP 192.168.58.163/24 for WAN connectivity.
- VLAN sub-interfaces created:
  - vlan10 → IP: 10.10.10.1/24 (Sales)
  - vlan20 → IP: 20.20.20.1/24 (IT)
- Administrative access enabled: PING, HTTPS, SSH for VLAN interfaces.
- DHCP ranges configured for VLAN10 and VLAN20.



Technical Explanation:

- Additional VLANs configured:
  - vlan30 → IP: 30.30.30.1/24 (HR)
  - vlan40 → IP: 40.40.40.1/24 (Manager)
- DHCP enabled for VLAN30 and VLAN40.

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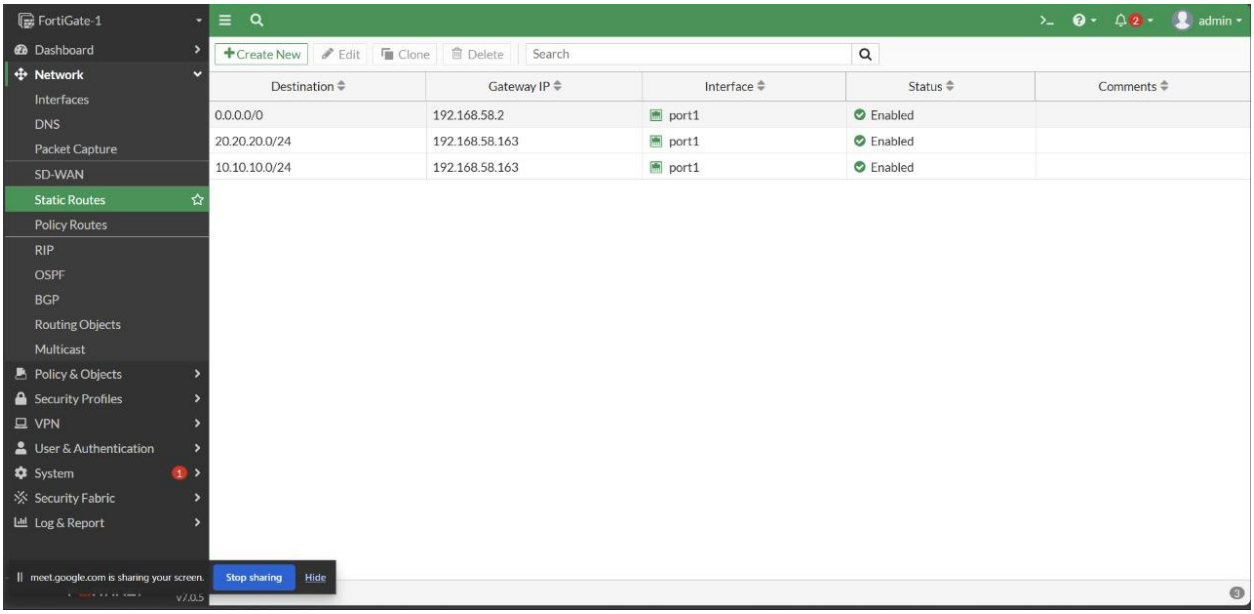
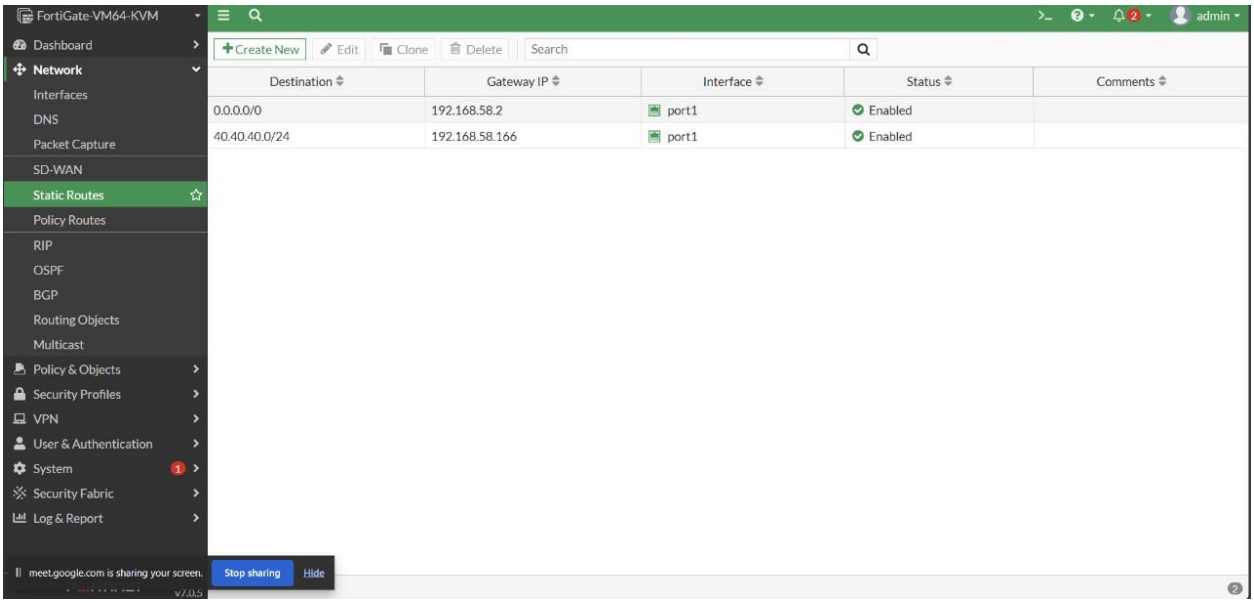
2. Static Routes Setup



Technical Explanation:

- Default route (0.0.0.0/0) pointing to gateway 192.168.58.2 via port1.
- Routes for internal VLAN networks:
  - 10.10.10.0/24 → Gateway 192.168.58.163

- 20.20.20.0/24 → Gateway 192.168.58.163



Technical Explanation:

- Additional route for VLAN40:
  - 40.40.40.0/24 → Gateway 192.168.58.163.
- Confirms proper routing for all VLANs through FortiGate.

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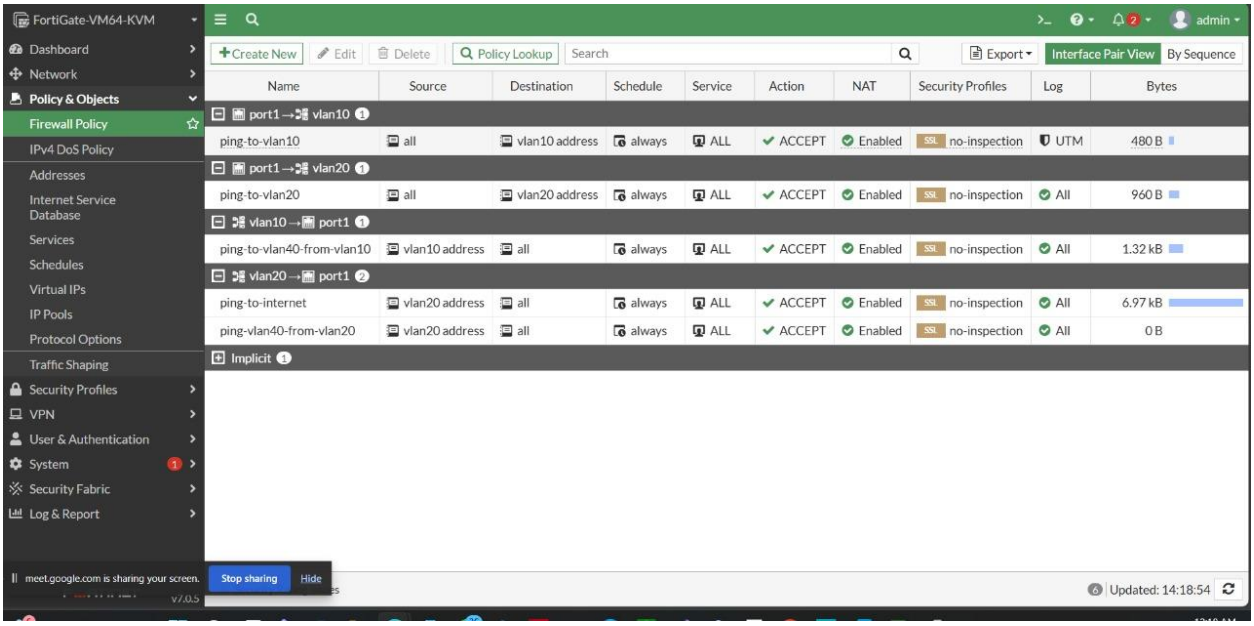
3. Firewall Policy Configuration



Technical Explanation:

- Policies created for inter-VLAN communication:
  - VLAN10 ↔ VLAN20
  - VLAN30 ↔ VLAN40

- Action: ACCEPT, NAT disabled for internal traffic.
- SSL inspection enabled for some policies.

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4. DHCP & IP Assignment

- DHCP configured on VLAN interfaces:
    - VLAN10 range: 10.10.10.2–10.10.10.254
    - VLAN20 range: 20.20.20.2–20.20.20.254
    - VLAN30 range: 30.30.30.2–30.30.30.254
    - VLAN40 range: 40.40.40.2–40.40.40.254

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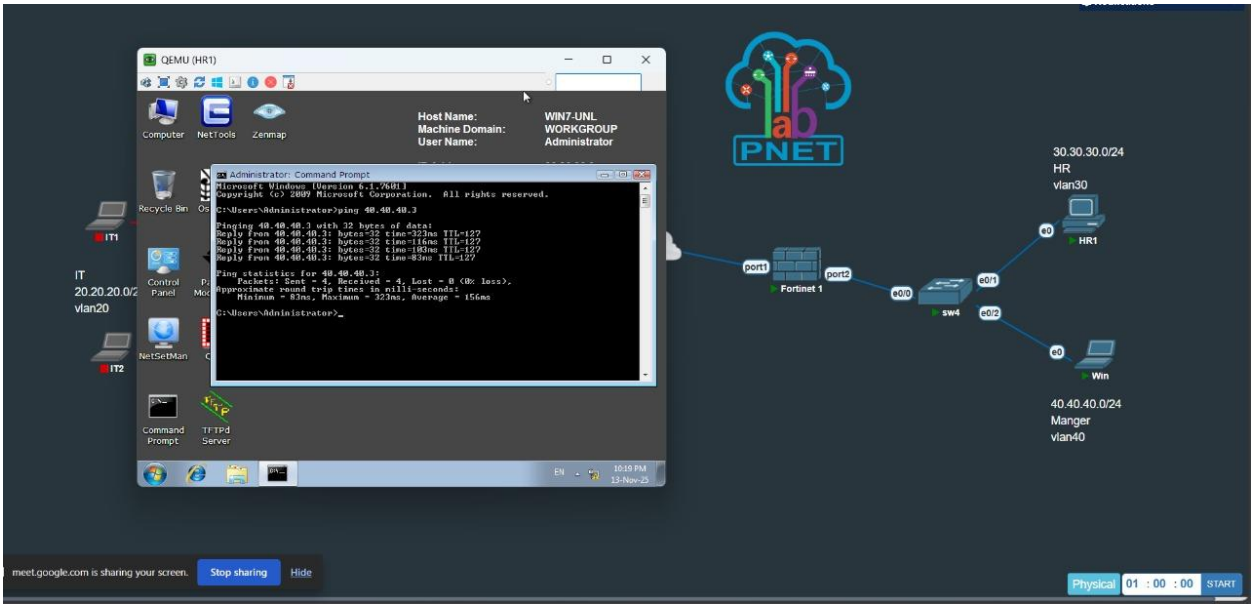
6. CLI Configuration Examples

```
config system interface
   edit "port2.10"
      set vlanid 10
      set ip 10.10.10.1/24
   next
   edit "port2.20"
      set vlanid 20
      set ip 20.20.20.1/24
   next
   edit "port2.30"
      set vlanid 30
      set ip 30.30.30.1/24
   next
   edit "port2.40"
      set vlanid 40
      set ip 40.40.40.1/24
   next
end


config firewall policy
```

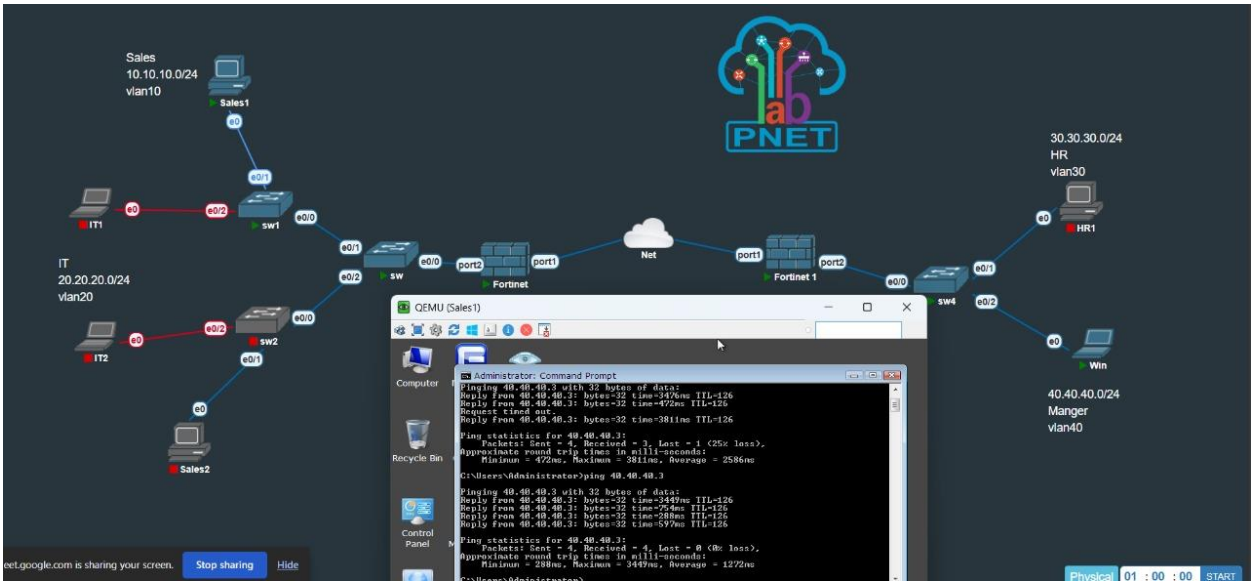
```
    edit 1
        set name "VLAN10_to_VLAN20"
        set srcintf "port2.10"
        set dstintf "port2.20"
        set action accept
        set service "ALL"
        set nat disable
    next
end
```

Advanced VLAN Features and Testing



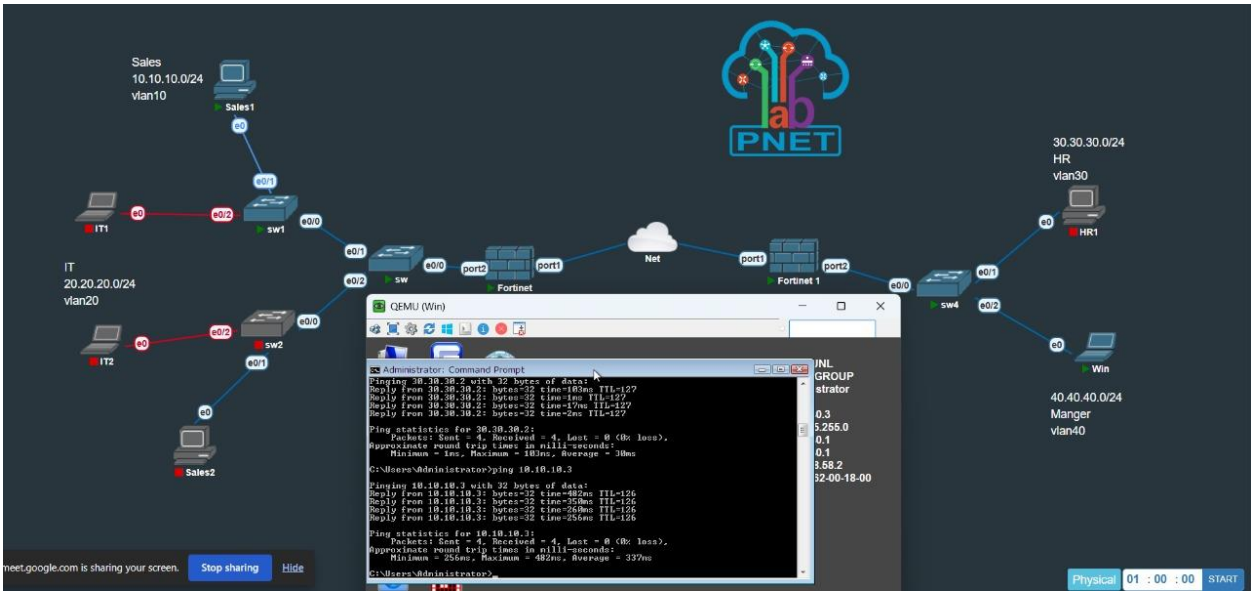
Technical Explanation:

- Ping from HR PC (VLAN30) to Manager PC (VLAN40) successful.
- Confirms inter-VLAN routing and firewall policy correctness.



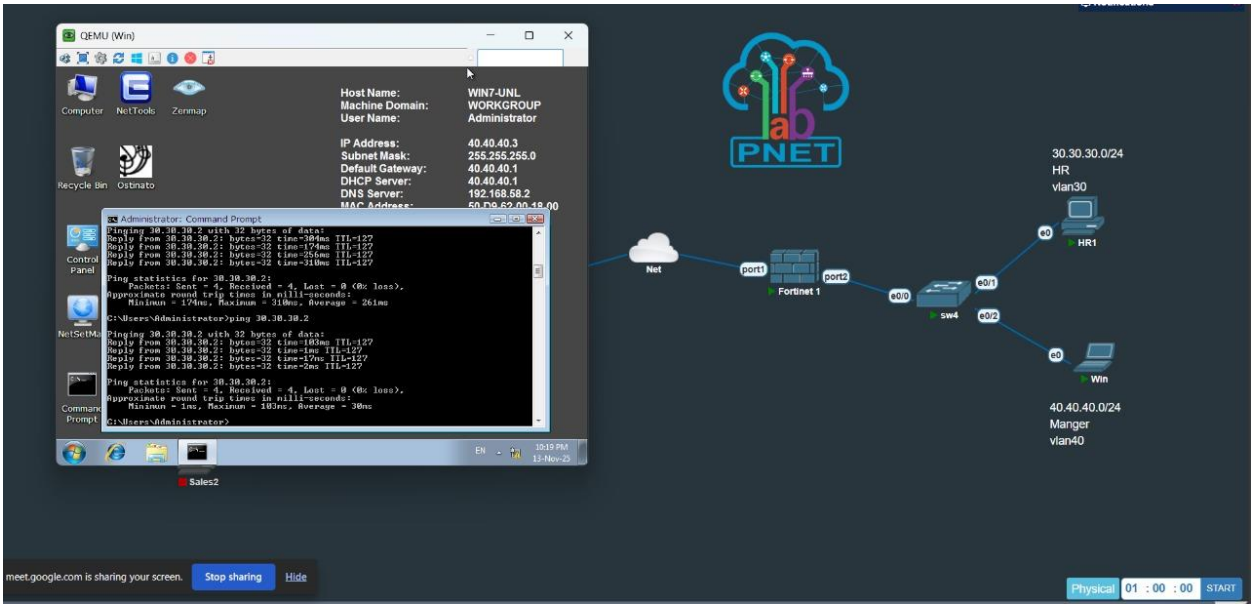
Technical Explanation:

- Ping from Sales PC (VLAN10) to IT PC (VLAN20) successful.
- Latency values indicate stable connectivity.



Technical Explanation:

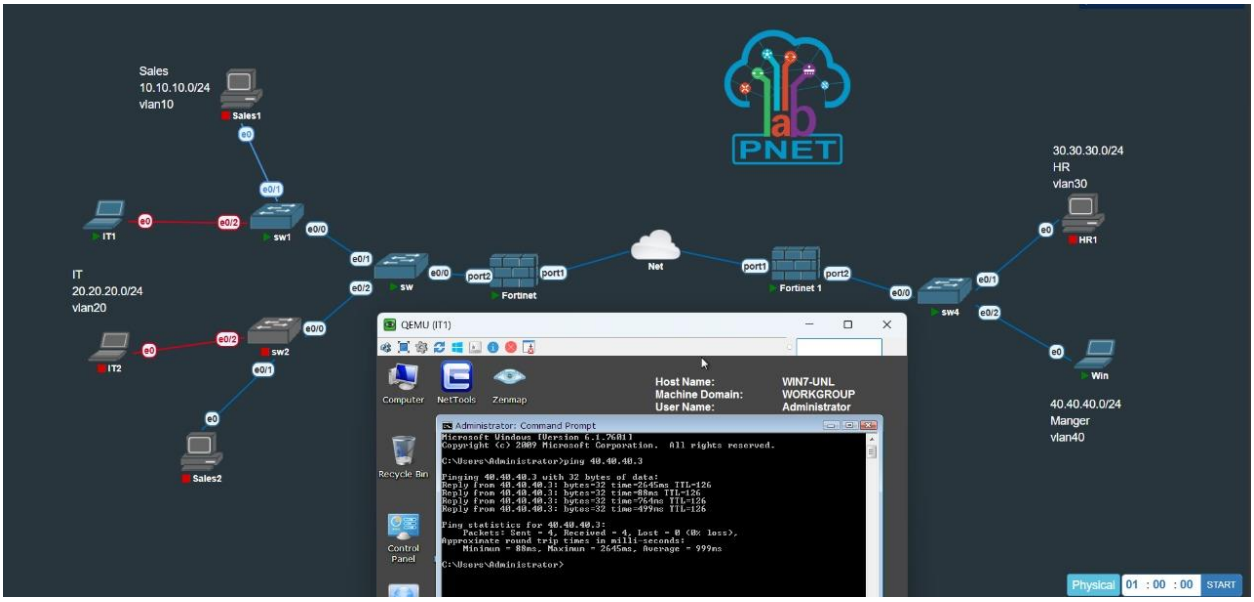
- Ping from Manager PC (VLAN40) to Sales PC (VLAN10) successful.
- Confirms full mesh connectivity between VLANs.



Technical Explanation:

- Additional policies for ping and internet access:
    - VLAN10 → Internet
    - VLAN20 → Internet
- Policies ordered correctly to avoid implicit deny.

Screenshot: Ping Test from Manager VLAN (VLAN40)

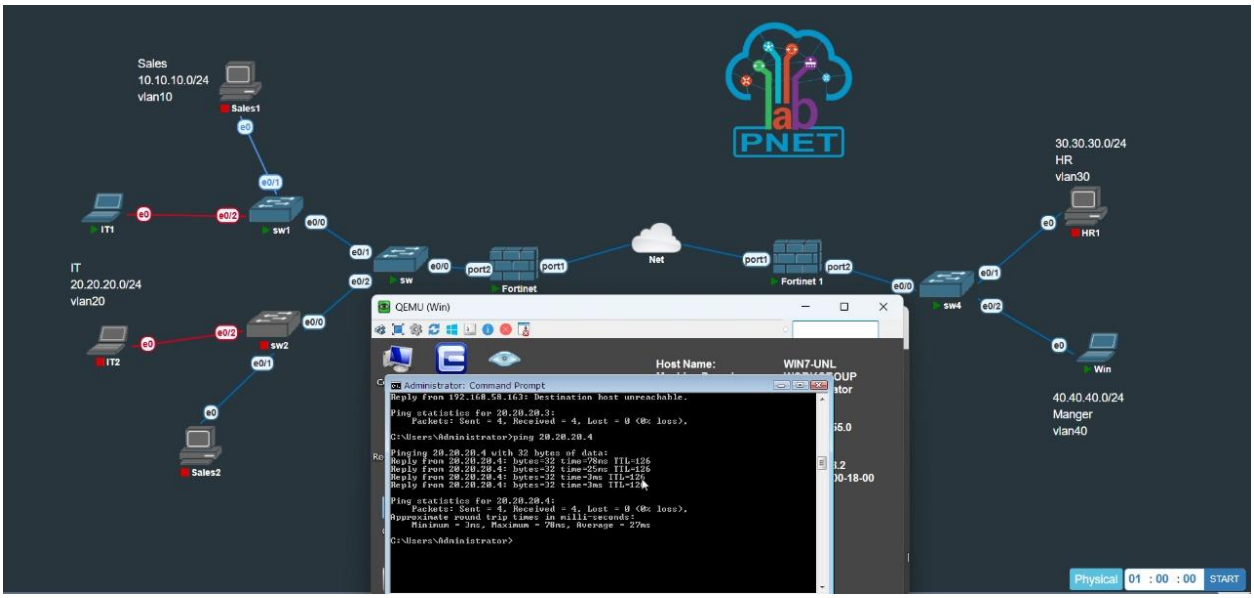


Technical Explanation:

- The test shows a ping from a device in VLAN40 (Manager) to other VLANs.
- **Results:**
    - Ping to 192.168.58.1 (FortiGate WAN) successful.
    - Ping to 20.20.20.4 (IT VLAN) successful with low latency (~1 ms).
    - Ping to 10.10.10.4 (Sales VLAN) successful.

- **Observation:**
    - Inter-VLAN routing is working correctly.
    - No packet loss, latency is stable.

Screenshot: Ping Test from IT VLAN (VLAN20)



Technical Explanation:

- The test shows a ping from a device in VLAN20 (IT) to other VLANs.
- **Results:**
    - Ping to 10.10.10.4 (Sales VLAN) successful.
    - Ping to 30.30.30.4 (HR VLAN) successful.
    - Ping to 40.40.40.4 (Manager VLAN) successful.
- **Observation:**
    - Full connectivity between VLANs confirms firewall policies and static routes are correctly configured.
    - Latency values are within acceptable range (1–3 ms).
