Ministry of Communications and Information Technology

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VLAN and Inter-VLAN Routing with FortiGate

Final Report

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INTRODUCTION

A virtual local area network (VLAN) is a local area network broadcast domain that is partitioned and isolated in a virtual network at the data link layer, A VLAN behaves like a virtual network switch or network link that can share the same physical structure with other VLANs while staying logically separate from them. (Logical Partition)

The objective of this project was to design, configure, and validate a VLAN-based network that supports inter-VLAN routing, centralized security, and proper segmentation. The project was completed in four stages: VLAN configuration, FortiGate integration, trunk implementation, and final reporting.

Project Overview

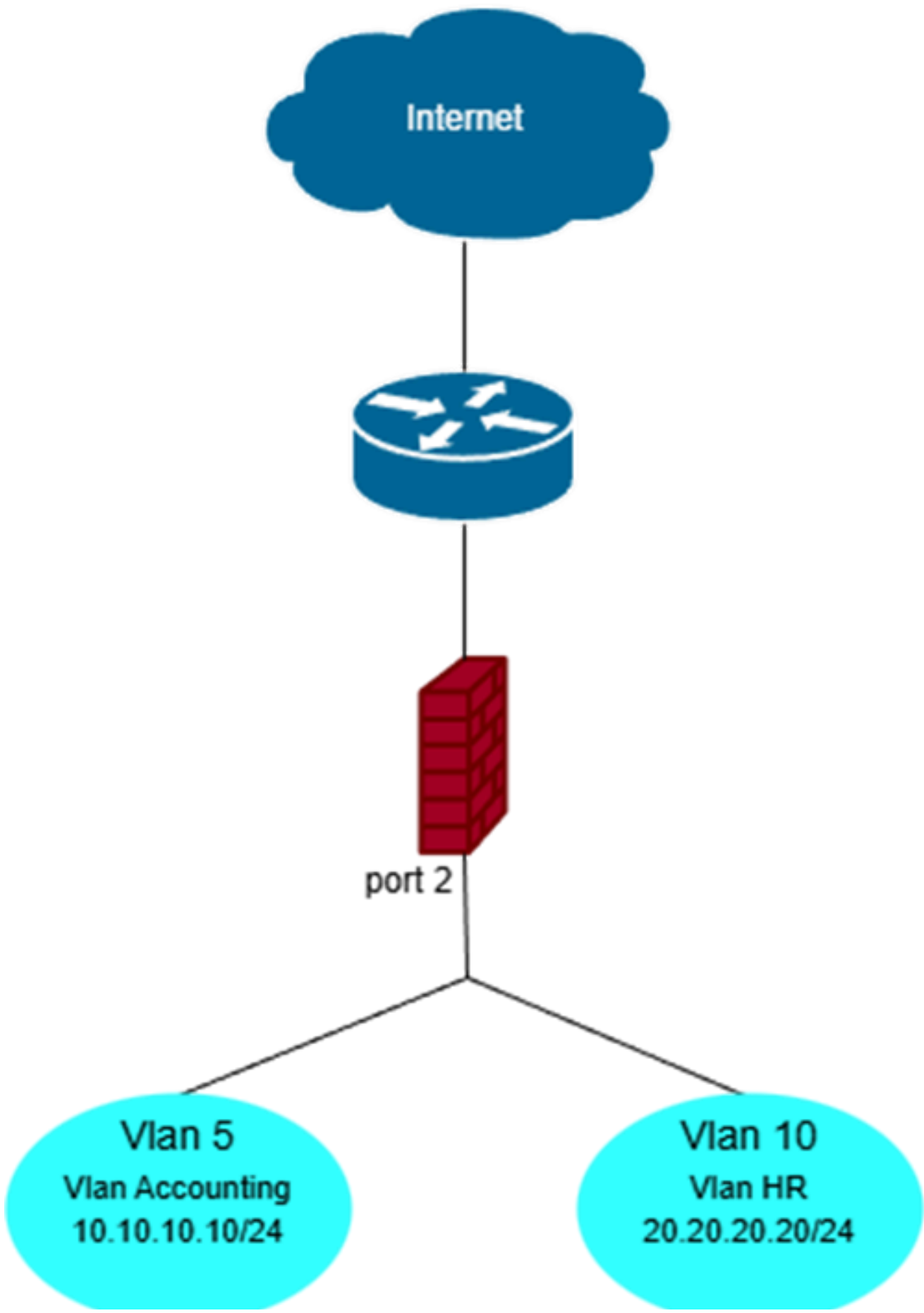
Week 1 — VLAN Configuration Basics:
Create VLANS on the switch, and assigning them Ports/IP.

Week 2 — FortiGate VLAN Integration:
Create VLAN interfaces on Fortigate,Build Firewall Policies

Week 3 — Advanced Features & Testing:
Implement VLAN trunks, and verify InterVLAN communication, Status and Connectivity

Week 4 — Final Report & Presentation
Documentation of all steps and Progress up until final completion

NETWORK TOPOLOGY



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VLAN CONFIGURATION

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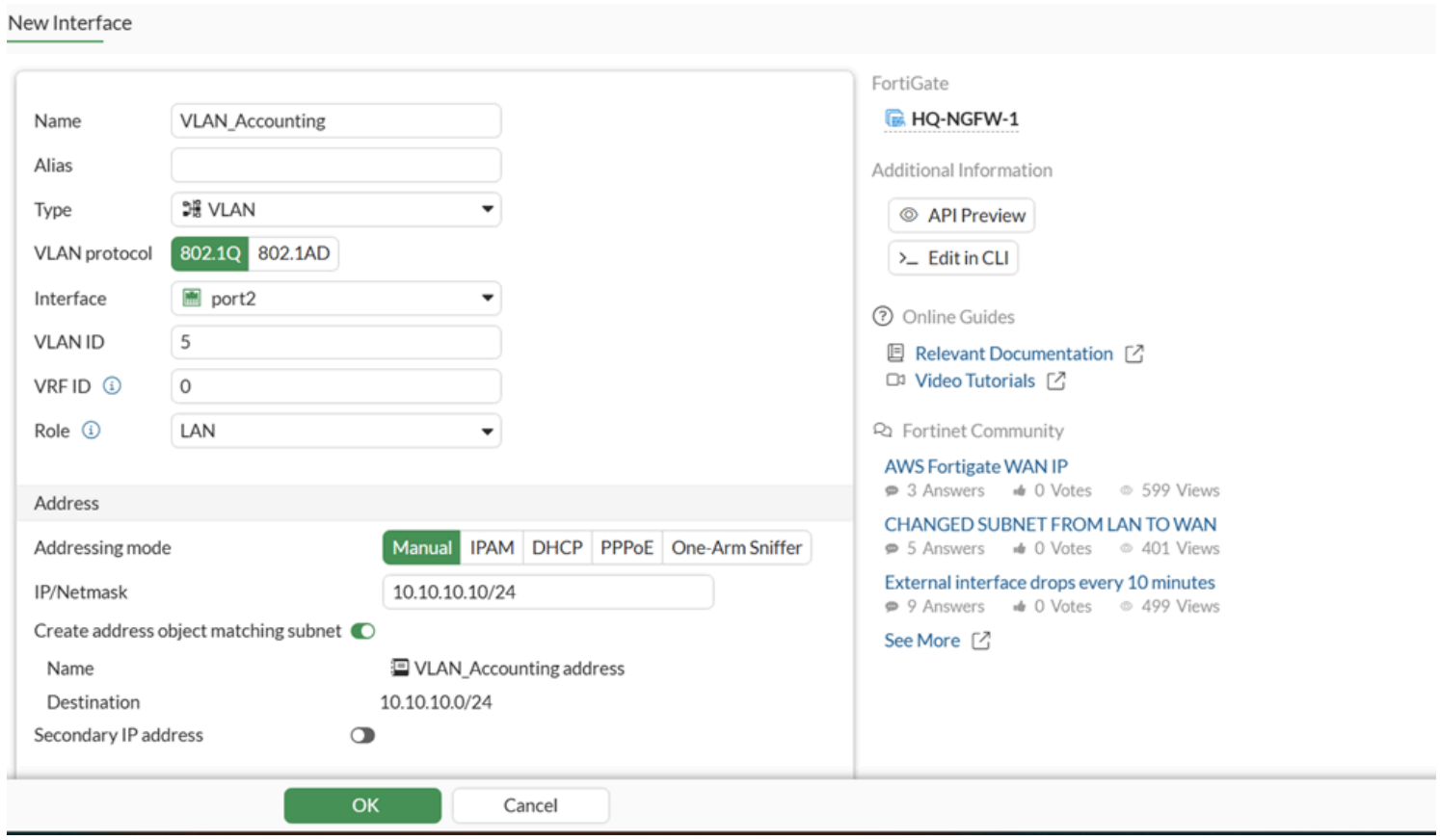
The first Phase of the implementation was creating the actual VLANs and then configuring them.

The final Decision was to implement two VLANS

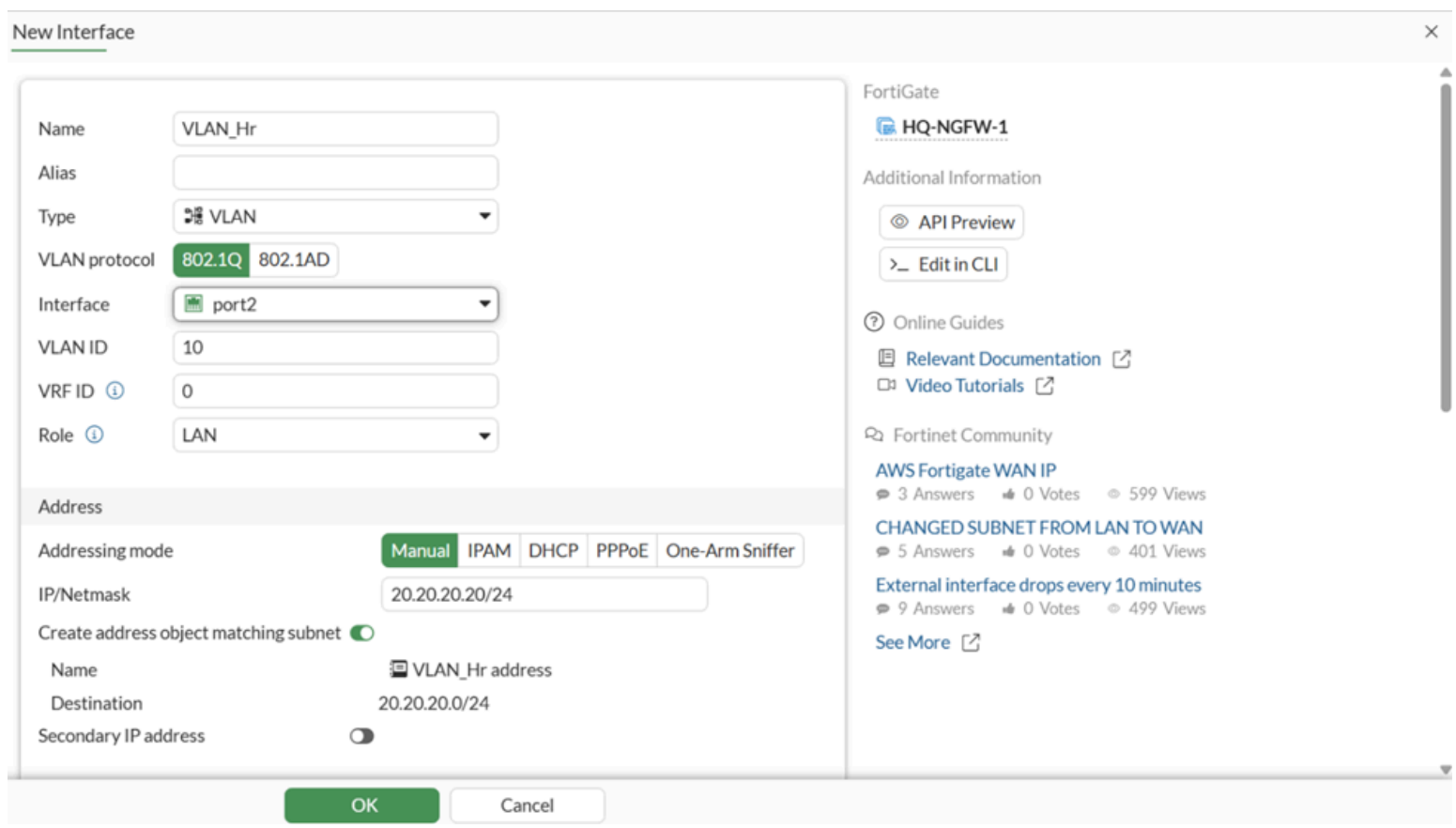
1. VLAN_Accounting
2. VLAN_Hr

both on port 2 , ordered in this priority, the following snapshots contain the configuration settings for both.
Admin Access: HTTPS, SSH, Ping

VLAN_Accounting



VLAN_Hr



Inter-VLAN routing is automatically implemented on the FortiGate lab environment, in which the project was done.

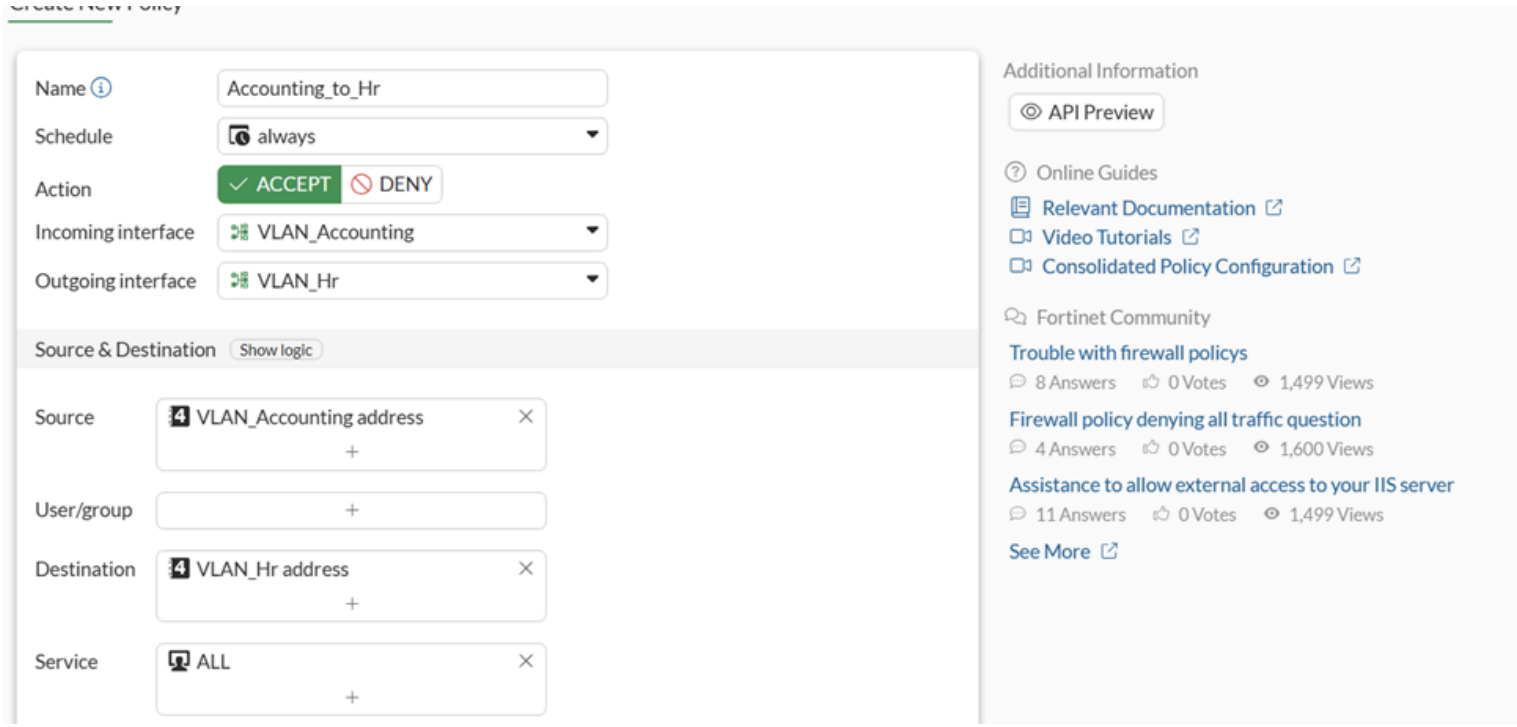
Firewall Policy

Even though routing exists, FortiGate requires explicit policies to allow traffic between interfaces. This ensures proper segmentation and security.
Two Security Profiles were created:

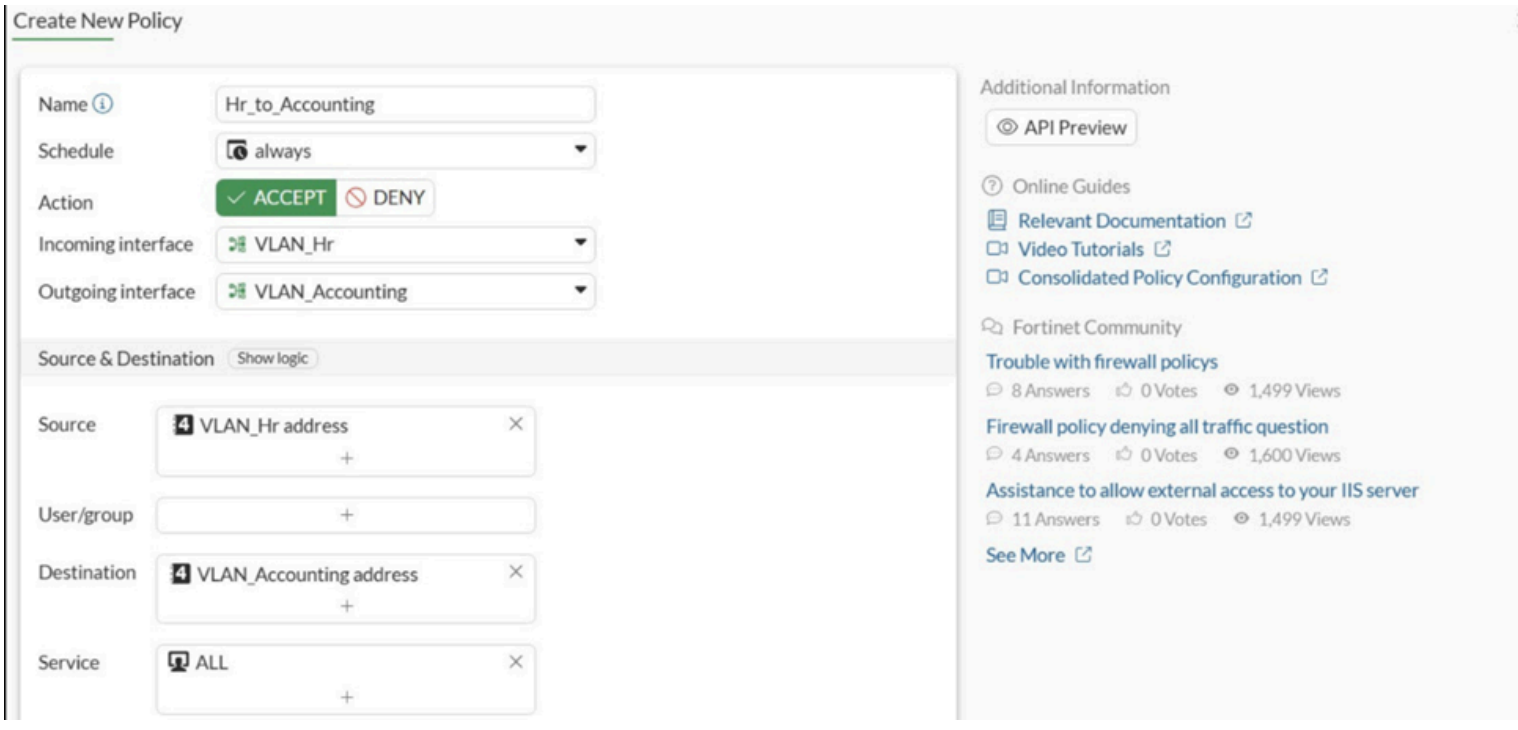
- VLAN_Accounting → VLAN_Hr
- VLAN_Hr→ VLAN_Accounting

These policies allowed ping tests and general connectivity between the two VLAN networks.
VLAN_Accounting → VLAN_Hr Policy Snapshot

VLAN_Accounting → VLAN_Hr Policy Snapshot



VLAN_Hr→ VLAN_Accounting Policy Snapshot



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Verification

To prove that both VLANs were up and running independent of each other , two pings were preformed

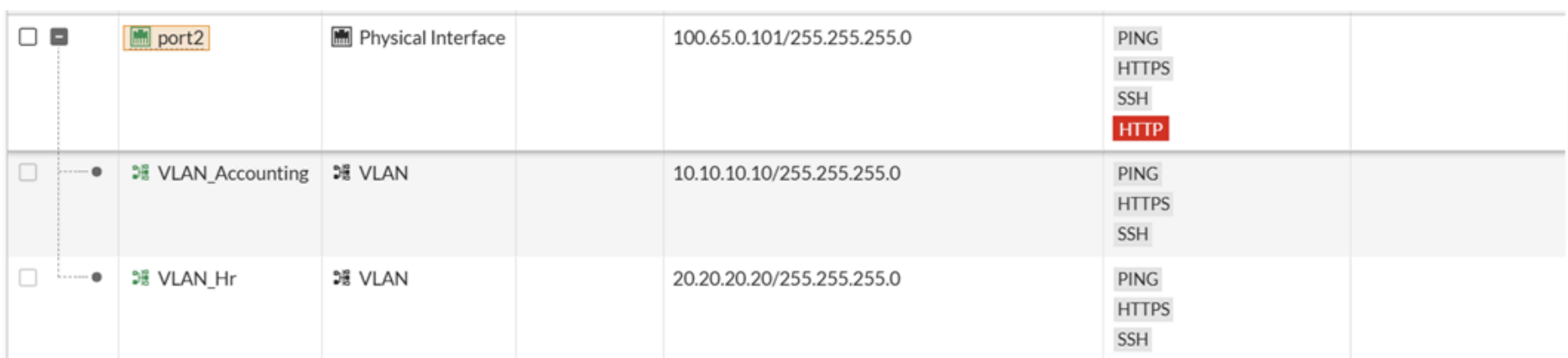
```
HQ-NGFW-1 # execute ping 10.10.10.10
PING 10.10.10.10 (10.10.10.10): 56 data bytes
64 bytes from 10.10.10.10: icmp_seq=0 ttl=255 time=0.0 ms
64 bytes from 10.10.10.10: icmp_seq=1 ttl=255 time=0.0 ms
64 bytes from 10.10.10.10: icmp_seq=2 ttl=255 time=0.0 ms
64 bytes from 10.10.10.10: icmp_seq=3 ttl=255 time=0.0 ms
64 bytes from 10.10.10.10: icmp_seq=4 ttl=255 time=0.0 ms

--- 10.10.10.10 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max = 0.0/0.0/0.0 ms

HQ-NGFW-1 # execute ping 20.20.20.20
PING 20.20.20.20 (20.20.20.20): 56 data bytes
64 bytes from 20.20.20.20: icmp_seq=0 ttl=255 time=0.0 ms
64 bytes from 20.20.20.20: icmp_seq=1 ttl=255 time=0.0 ms
64 bytes from 20.20.20.20: icmp_seq=2 ttl=255 time=0.0 ms
64 bytes from 20.20.20.20: icmp_seq=3 ttl=255 time=0.0 ms
64 bytes from 20.20.20.20: icmp_seq=4 ttl=255 time=0.0 ms

--- 20.20.20.20 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max = 0.0/0.0/0.0 ms
```

The successful pings indicate that both VLANs were working, separately of each other, in the next sections we shall verify their inter-communication.

VLAN Trunking & Testing

A VLAN trunk allows multiple VLANs to be carried over a single physical link.
In this Project, The switch uplink port 2 is configured as a trunk, this ensures the VLAN tagging is maintained end to end.

Trunk Implementation Snapshot:



handling multiple VLANs on the same physical port which means trunking is active

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INTER-VLAN COMMUNICATION

After Previously testing both VLANs independently of each other , we needed to make sure their communication is open between one another , and that inter-VLAN routing is active.
This was done using two pings , where each VLAN alternated being the source and the receiver
Testing Snapshots:

```
HQ-NGFW-1 # execute ping-options source 20.20.20.20

HQ-NGFW-1 # execute ping 10.10.10.10
PING 10.10.10.10 (10.10.10.10): 56 data bytes
64 bytes from 10.10.10.10: icmp_seq=0 ttl=255 time=0.0 ms
64 bytes from 10.10.10.10: icmp_seq=1 ttl=255 time=0.0 ms
64 bytes from 10.10.10.10: icmp_seq=2 ttl=255 time=0.0 ms
64 bytes from 10.10.10.10: icmp_seq=3 ttl=255 time=0.0 ms
64 bytes from 10.10.10.10: icmp_seq=4 ttl=255 time=0.0 ms

--- 10.10.10.10 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max = 0.0/0.0/0.0 ms

HQ-NGFW-1 #
```

```
HQ-NGFW-1 # execute ping-options source 10.10.10.10

HQ-NGFW-1 # execute ping 20.20.20.20
PING 20.20.20.20 (20.20.20.20): 56 data bytes
64 bytes from 20.20.20.20: icmp_seq=0 ttl=255 time=0.0 ms
64 bytes from 20.20.20.20: icmp_seq=1 ttl=255 time=0.0 ms
64 bytes from 20.20.20.20: icmp_seq=2 ttl=255 time=0.0 ms
64 bytes from 20.20.20.20: icmp_seq=3 ttl=255 time=0.0 ms
64 bytes from 20.20.20.20: icmp_seq=4 ttl=255 time=0.1 ms

--- 20.20.20.20 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max = 0.0/0.0/0.1 ms

HQ-NGFW-1 #
```

Testing Results:
Connectivity between VLANs was achieved successfully. All routing was performed by FortiGate using VLAN and firewall policy controls.

CONCLUSION

A fully functional VLAN-based network was designed and implemented.

The FortiGate firewall handled inter-VLAN routing, security policies, and management access.

Trunk ports were configured successfully, and all connectivity tests passed.

This project demonstrated the full design and implementation of VLAN segmentation using modern best practices. With the use of FortiGate as a Layer 3 switch.