RECOMP Sprint 1 Report – Group 5

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Introduction

In this report it will be detailed how the network created for 3 sites of the hypothetical company *"RECOMP Corporation WAN"*, with each of those sites located in Oporto, Warsaw and Munich was setup. Each section of this report will be dedicated to each of these sites, and how their local networks were configured.

Address Schemes

Oporto

Parameters for our group:

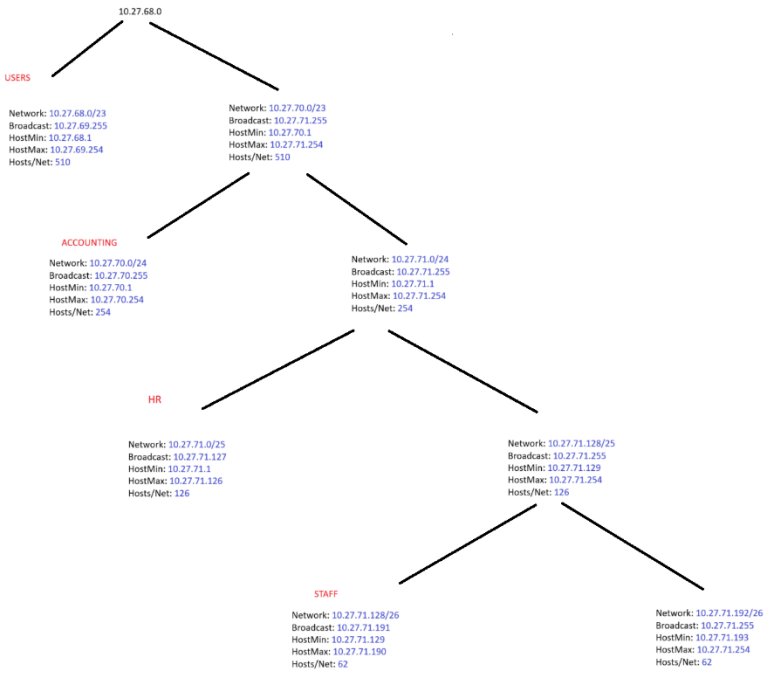
- Porto IPV4 address: 10.27.68.0/22
- Warsaw IPV4 address: 192.168.154.0/23
- Munich IPV4 address: 172.21.72.0/23
- VTP Domain: RECOMP2425M1B05
- DHCP Domain: RECOMP2425M1B05.recomp.com

Here follows a table with all available networks in the Oporto location site. Four separate networks were setup on this site:

- Users, with 500 nodes
- Accounting, with 200 nodes
- HR, with 100 nodes
- Staff, with 50 nodes

Network	Network address	Broadcast address	Mask	First valid node address	Last valid node address
VLAN 40 - USERS - 500 nodes	10.27.68.0/23	10.27.69.255	255.255.254.0	10.27.68.1	10.27.69.254
VLAN 20 - ACCOUNTING - 200 nodes	10.27.70.0/24	10.27.70.255	255.255.255.0	10.27.70.1	10.27.70.254
VLAN 30 - HR - 100 nodes	10.27.71.0/25	10.27.71.127	255.255.255.128	10.27.71.1	10.27.71.126
VLAN 10 - STAFF - 50 nodes	10.27.71.128/26	10.27.71.191	255.255.255.192	10.27.71.129	10.27.71.190
HQ Router - HQ-MLS1	10.27.71.192/30	10.27.71.195	255.255.255.252	10.27.71.193	10.27.71.194
HQ Router - HQ-MLS2	10.27.71.196/30	10.27.71.199	255.255.255.252	10.27.71.197	10.27.71.194

Depicted below is a visual representation of the same network scheme.



The following table represents the interface and assigned addresses for each router/switch in the Oporto network.

HQ(PORTO) - Router	Gig0/0/0	Gig0/0	Gig0/1	
	209.165.200.129	10.27.71.193	10.27.71.197	
HQ-MLS1 - Multilayer Switch	VLAN 10	VLAN 20	VLAN 30	VLAN 40
	10.27.71.129	10.27.70.1	10.27.71.1	10.27.68.1
HQ-MLS2 - Multilayer Switch	VLAN 10	VLAN 20	VLAN 30	VLAN 40
	10.27.71.130	10.27.70.2	10.27.71.2	10.27.68.2

Redundancy between MLS1 and MLS2

The interconnection between the multilayer switches establishes a redundant path within the network. Should one of the switches fail, the other seamlessly takes over the traffic, ensuring high availability.

Cross-Connections

The "X" connecting the multilayer switches to the access switches represents redundancy at the access level. This means that the access switches have alternative pathways to communicate with the main switches (MLS1 or MLS2), enhancing network resilience and preventing the failure of a single switch from disrupting operations.

Multilayer Switch

As multilayer switches, MLS can perform routing functions (Layer 3) in addition to standard switching (Layer 2). This capability facilitates efficient routing between different VLANs, optimizing communication across the network.

Connections between Router and Switches(**Router - MLS1 - SW1** and **Router - MLS2 - SW2**), the connections between the router and the multilayer switches utilize Gigabit Ethernet (GigE) technology. This choice is critical, as Gigabit Ethernet offers superior bandwidth (1 Gbps) compared to Fast Ethernet (100 Mbps). Given that these multilayer switches manage

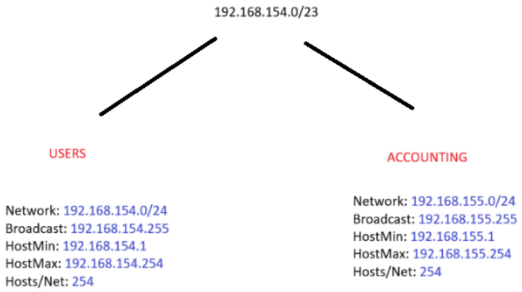
a substantial volume of traffic and serve as the backbone of the network, a faster connection ensures optimal performance and reduced latency.

Therefore, whenever possible, we should prioritize the use of Gigabit Ethernet for primary connections to guarantee greater transmission capacity and efficient redundancy.

BR Warsaw

The addressing scheme for BR1 networks in Warsaw is as follows:

Network	Network address	Broadcast address	Mask	First valid node address	Last valid node address
USERS - 200 nodes - VLAN 40	192.168.154.0/24	192.168.154.255	255.255.255.0	192.168.154.1	192.168.154.254
ACCOUNTING - 200 nodes - VLAN 20	192.168.155.0/24	192.168.155.255	255.255.255.0	192.168.155.1	192.168.155.254



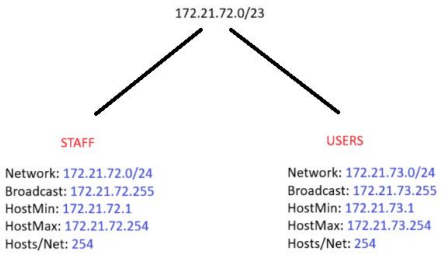
The following table represents the interfaces and assigned addresses for the router in the Warsaw network

BR1 (Warsaw) - Router	Gig0/0/0	f0/1-10 - VLAN 20	f0/11-20 - VLAN 40
	192.0.2.97	192.168.155.1	192.168.154.1

BR Munich

The addressing scheme for BR2 networks in Munich is as follows:

Network	Network address	Broadcast address	Mask	First valid node address	Last valid node address
USERS - 200 nodes - VLAN 40	172.21.72.0/24	172.21.72.255	255.255.255.0	172.21.72.1	172.21.72.254
STAFF - 200 nodes - VLAN 10	172.21.73.0/24	172.21.73.255	255.255.255.0	172.21.73.1	172.21.73.254



The following table represents the interfaces and assigned addresses for the router in the Munich network

BR2 (Munich) - Router	Gig0/0/0	f0/1-10 - VLAN 10	f0/11-20 - VLAN 40
	193.136.60.147	172.21.73.1	172.21.72.1

Device configuration

Oporto

Starting off, the first configuration done at Oporto was joining two interfaces between the main Multi-layer switches, and configuring them as a trunk.

VLAN Configuration

For multilayer switch 1 (MLS1), the FastEthernet ports 1-24 are configured as trunks using 802.1Q encapsulation, allowing all VLANs, with VLAN 50 set as the native VLAN. For both switches, VLAN 10 (STAFF), 20 (ACCOUNTING), 30 (HR), 40 (USERS), 50 (NATIVE), and 99 (BLACKHOLE) are created. Both switches share the same VTP domain "RECOMP2425M1B05" with the password "4232pmocer" and are configured in VTP server mode.

MLS1	**MLS2**

`interface range fa0/1 - 24`
`switchport trunk encapsulation dot1q`
`switchport mode trunk`
`switchport trunk allowed vlan all`
`switchport trunk native vlan 50`
 	
`vlan 10`
`name STAFF`
`vlan 20`
`name ACCOUNTING`
`vlan 30`
`name HR`
`vlan 40`
`name USERS`
`vlan 50`
`name NATIVE`
`vlan 99`
`name BLACKHOLE`
 	
`vtp domain RECOMP2425M1B05`
`vtp password 4232pmocer`
`vtp mode server`
	`vlan 10`
	`name STAFF`
	`vlan 20`
	`name ACCOUNTING`
	`vlan 30`
	`name HR`
	`vlan 40`
	`name USERS`
	`vlan 50`
	`name NATIVE`
	`vlan 99`
	`name BLACKHOLE`
	
	`vtp domain RECOMP2425M1B05`
	`vtp password 4232pmocer`
	`vtp mode server`

STP

At this point it is indicated that MLS1 must be defined as root bridge for VLANS 10 and 20, and this must be the secondary root bridge for VLANS 30 and 40, using rapid-STP. Furthermore, MLS2 must have the configuration opposite to MLS1, thus being the root bridge for VLANS 30 and 40, and secondary root bridge for VLANS 10 and 20.

We added the following commands:

MLS1	MLS2
spanning-tree vlan 10 root primary spanning-tree vlan 20 root primary spanning-tree vlan 30 root secondary spanning-tree vlan 40 root secondary	spanning-tree vlan 30 root primary spanning-tree vlan 40 root primary spanning-tree vlan 10 root secondary spanning-tree vlan 20 root secondary

HSRP

In the next step, we configured the HSRP protocol to ensure both multilayer switches (MLSs) work well together. For each network, we designated one of the two switches as the priority switch, with each switch serving as the priority for two of the networks. This configuration ensures that both switches share the load and provide redundancy, maintaining network availability in case one switch fails.

MLS1	MLS2
interface vlan10 ip address 10.27.71.129 255.255.255.192 standby 10 ip 10.27.71.190 standby 10 priority 110 standby 10 preempt interface vlan20 ip address 10.27.70.1 255.255.255.0 standby 20 ip 10.27.70.254 standby 20 priority 110 standby 20 preempt interface vlan30 ip address 10.27.71.1 255.255.255.128 standby 30 ip 10.27.71.126 standby 30 priority 90 standby 30 preempt interface vlan40 ip address 10.27.68.1 255.255.254.0 standby 40 ip 10.27.69.254 standby 40 priority 90 standby 40 preempt	interface vlan30 ip address 10.27.71.2 255.255.255.128 standby 30 ip 10.27.71.125 standby 30 priority 110 standby 30 preempt interface vlan40 ip address 10.27.68.2 255.255.254.0 standby 40 ip 10.27.69.253 standby 40 priority 110 standby 40 preempt interface vlan10 ip address 10.27.71.130 255.255.255.192 standby 10 ip 10.27.71.179 standby 10 priority 90 standby 10 preempt interface vlan20 ip address 10.27.70.2 255.255.255.0 standby 20 ip 10.27.70.253 standby 20 priority 90 standby 20 preempt

VLAN on switches

Moving on from multilayer switches, the Layer 2 switches were configured to allow the appropriate VLANs to pass through them. This configuration increases stability and removes unnecessary traffic from the network. Additionally, the VTP domain was created to enhance security.

SW1	SW2
vtp domain RECOMP2425M1B05 vtp password 4232pmocer vtp mode client interface range FastEthernet 0/1-4 switchport mode trunk no shutdown interface range FastEthernet 0/5-8 switchport mode access switchport access vlan 10 no shutdown interface range FastEthernet 0/9-12 switchport mode access switchport access vlan 20 interface range FastEthernet 0/13-16 switchport mode access switchport access vlan 30 interface range FastEthernet 0/17-20 switchport mode access switchport access vlan 40 interface range FastEthernet 0/21-24 switchport mode access switchport access vlan 99	vtp domain RECOMP2425M1B05 vtp password 4232pmocer vtp mode client interface range FastEthernet 0/5-8 switchport mode access switchport access vlan 10 interface range FastEthernet 0/9-12 switchport mode access switchport access vlan 20 interface range FastEthernet 0/13-16 switchport mode access switchport access vlan 30 interface range FastEthernet 0/17-20 switchport mode access switchport access vlan 40 interface range FastEthernet 0/21-24 switchport mode access switchport access vlan 99

To check the propagation of VLANS across the remaining switches, on each switch, we used the command below and the following result was obtained:

DHCP configuration

To ensure each user automatically receives an IP address, we configured the DHCP protocol. By adding VLAN pools and excluding specific addresses, we improve network stability and security.

MLS1	MLS2
ip dhcp excluded-address 10.27.71.129 10.27.71.130 ip dhcp excluded-address 10.27.71.178 10.27.71.179 ip dhcp pool VLAN10-STAFF domain-name RECOMP2425M1B05 network 10.27.71.128 255.255.255.192 default-router 10.27.71.193 dns-server 8.8.8.8 ip dhcp excluded-address 10.27.70.1 10.27.70.2 ip dhcp excluded-address 10.27.70.253 10.27.70.254 ip dhcp pool VLAN20-ACCOUNTING domain-name RECOMP2425M1B05 network 10.27.70.0 255.255.255.0 default-router 10.27.70.1 dns-server 8.8.8.8	ip dhcp excluded-address 10.27.71.1 10.27.71.2 ip dhcp excluded-address 10.27.71.125 10.27.71.126 ip dhcp pool VLAN30-HR domain-name RECOMP2425M1B05 network 10.27.71.0 255.255.255.128 default-router 10.27.71.2 dns-server 8.8.8.8 ip dhcp excluded-address 10.27.68.1 10.27.69.254 ip dhcp excluded-address 10.27.68.2 10.27.69.253 ip dhcp pool VLAN40-USERS domain-name RECOMP2425M1B05 network 10.27.68.0 255.255.254.0 default-router 10.27.68.2 dns-server 8.8.8.8

Warsaw and Munich Configuration

After configuring the HQ network, we focused on ensuring connectivity with the two other branches. Similar to the HQ network, we created VLAN pools and implemented the DHCP protocol to achieve automatic IP address assignment. Additionally, we configured the switches to allow only specific VLANs on their interfaces, which enhances the reliability and structure of our branch networks.

Warsaw

BR	SW1
hostname Warsaw ip dhcp pool VLAN20-ACCOUNTING network 192.168.155.0 255.255.255.0 default-router 192.168.155.254 dns-server 8.8.8.8 ip dhcp pool VLAN40-USERS network 192.168.154.0 255.255.255.0 default-router 192.168.154.254 dns-server 8.8.8.8 interface GigabitEthernet0/0.20 encapsulation dot1Q 20 ip address 192.168.155.254 255.255.255.0 interface GigabitEthernet0/0.40	hostname SW1 interface GigabitEthernet0/1 switchport access vlan 50 switchport trunk native vlan 50 switchport mode trunk interface FastEthernet0/1-10 switchport access vlan 20 switchport mode access interface FastEthernet0/11-20 switchport access vlan 40 switchport mode access interface FastEthernet0/21-24 switchport access vlan 99 switchport mode access

encapsulation dot1Q 40 ip address 192.168.154.254 255.255.255.0 ip dhcp excluded-address 192.168.154.254 ip dhcp excluded-address 192.168.155.254	shutdown

Munich

This branch differs from the previous one in the manually configured router IP address. Everything else remains similar.

BR	**SW1**
hostname Munich interface GigabitEthernet0/0/0 ip address 193.136.60.147 255.255.255.248 ip classless ip route 0.0.0.0 0.0.0.0 193.136.60.150 ip dhcp pool VLAN10-STAFF network 172.21.73.0 255.255.255.0 default-router 172.21.73.254 dns-server 8.8.8.8 ip dhcp pool VLAN40-USERS network 172.21.72.0 255.255.255.0 default-router 172.21.72.254 dns-server 8.8.8.8 interface GigabitEthernet0/0.10 encapsulation dot1Q 10 ip address 172.21.73.254 255.255.255.0 interface GigabitEthernet0/0.40 encapsulation dot1Q 40 ip address 172.21.72.254 255.255.255.0 ip dhcp excluded-address 172.21.73.254 ip dhcp excluded-address 172.21.72.254	hostname SW1 interface GigabitEthernet0/1 switchport access vlan 50 switchport trunk native vlan 50 switchport mode trunk interface FastEthernet0/1-10 switchport access vlan 10 switchport mode access interface FastEthernet0/11-20 switchport access vlan 40 switchport mode access interface FastEthernet0/21-24 switchport access vlan 99 switchport mode access shutdown