



# Projeto de Redes de Comunicações

Dept. de Eletrónica, Telecomunicações e Informática

Universidade de Aveiro

Joana Santiago, Raquel Meira

(119705) joanassantiago@ua.pt, (118928) raquelsmeira@ua.pt

15 de novembro de 2024

## Aplicação dos Nmec nos IPs

A aluna 1 tem como número mecanográfico 119705 ficando assim x1: 1, x2: 9, x3: 7, x4: 0, x5: 5.  
Já a segunda aluna tem o número 118928 ficando assim x10: 1, x9: 8, x8: 9, x7: 2, x6: 8.

## Private and public IPv4 Addresses and Global IPv6

Aqui está uma tabela com os endereços IPs privados e públicos IPv4 e o IPv6 global, onde foram usados os números mecanográficos para completar, juntamente com o respectivo broadcast.

	<b>Calendar Inc</b>	<b>Horoscope Inc</b>
<b>Public IPv4 (sub)Network</b>	203.107.191.128/25	203.018.092.0/25
<b>Broadcast Public</b>	203.107.191.255	203.18.092.127
<b>Private IPv4 Network</b>	172.25.012.0/23	172.28.083.255/23
<b>Broadcast Private</b>	172.25.13.255	172.28.083.255
<b>Global IPv6 Network</b>	2002:A197:BC05::/48	2002:A189:BC28::/48

## Public IPv4 sub-Networks

### *Calendar Inc*

	<b>Network</b>	<b>Mask</b>	<b>Broadcast</b>	<b>Range</b>	<b>Gateway</b>
<b>NAT/PAT</b>	203.107.191.252	31	-	203.107.191.252 - 203.107.191.253	-
<b>VLAN2</b>	203.107.191.224	28	203.107.191.239	203.107.191.226 - 203.107.191.238	203.107.191.225
<b>VLAN4</b>	203.107.191.192	27	203.107.191.223	203.107.191.194 - 203.107.191.222	203.107.191.193
<b>VLAN6</b>	203.107.191.128	26	203.107.191.191	203.107.191.130 - 203.107.191.190	203.107.191.129
<b>VLAN8</b>	203.107.191.240	29	203.107.191.247	203.107.191.242 - 203.107.191.246	203.107.191.241
<b>VLAN12</b>	203.107.191.248	30	203.107.191.251	203.107.191.250 - 203.107.191.250	203.107.191.249

Analisando a quantidade de endereços IPv4 necessários para cada sub-rede pública do Calendar, é possível estabelecer uma máscara adequada, bem como o gateway e o intervalo de endereços destinado a cada VLAN. A rede pública em questão inicia no endereço 203.107.191.128 com uma máscara /25, o que disponibiliza 128 endereços IP a partir do 203.107.191.129. Assim, a soma dos endereços usados pelas cinco VLANs e pelo NAT/PAT deve ser inferior a 128 para que caibam todos na rede pública do Calendar.

Por exemplo, a VLAN 6 exige 50 endereços, logo, a máscara ideal é /26, pois esta cobre 64 endereços. Dessa forma, 203.107.191.128 será o endereço da sub-rede, 203.107.191.129 será o gateway, e haverá 61 endereços restantes para uso. O mesmo processo é aplicado às restantes VLANs.

Para o NAT/PAT, como só é necessário um endereço sem necessidade de gateway, uma máscara /31 é suficiente, pois provê 2 endereços, atendendo perfeitamente a essa demanda.

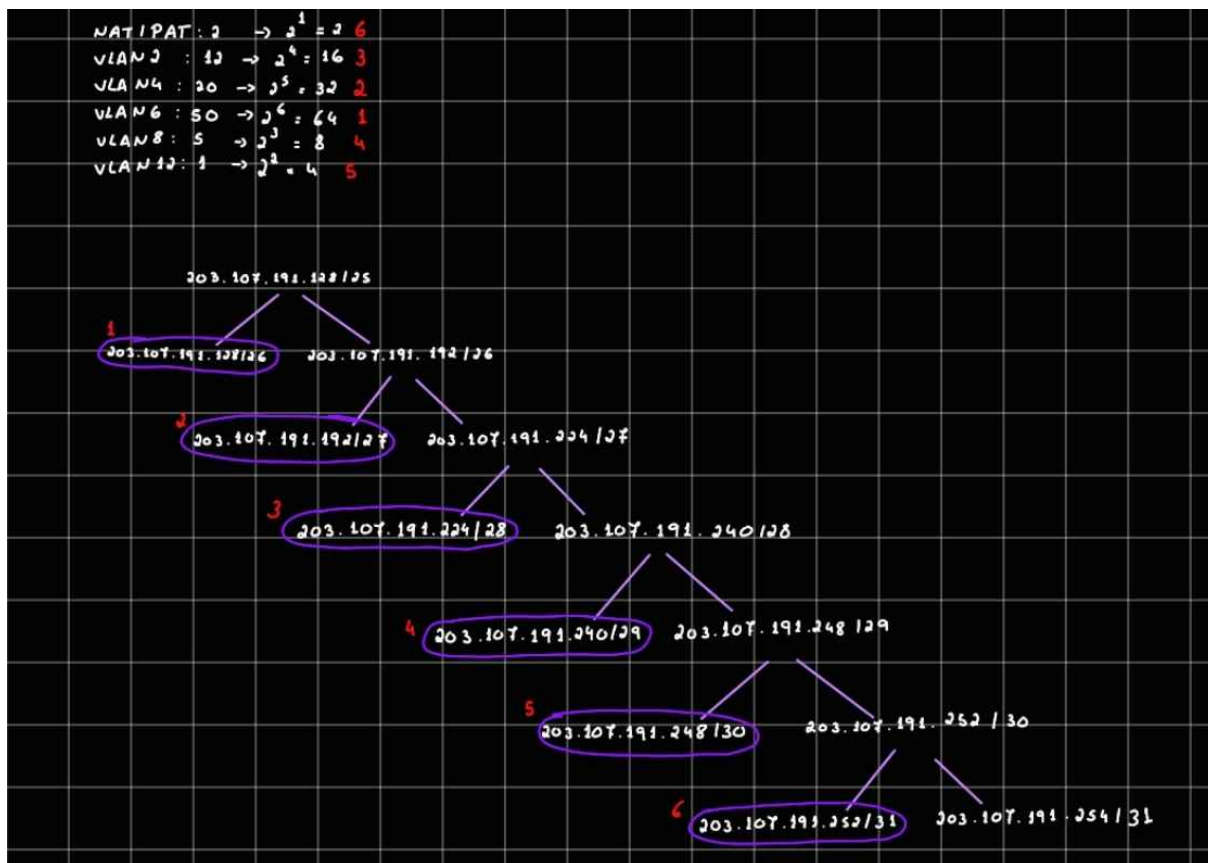


Figura 1: *Public IPv4 - Calender Inc*

### *Horoscope Inc*

	Network	Mask	Broadcast	Range	Gateway
NAT/PAT	203.018.092.116	31	-	203.018.092.116 - 203.018.092.117	-
VLAN14	203.018.092.0	27	203.018.092.31	203.018.092.2 - 203.018.092.30	203.018.092.1
VLAN16	203.018.092.32	27	203.018.092.63	203.018.092.34 - 203.018.092.62	203.018.092.33
VLAN18	203.018.092.64	28	203.018.092.79	203.018.092.66 - 203.018.092.78	203.018.092.65
VLAN20	203.018.092.80	28	203.018.092.95	203.018.092.82 - 203.018.092.94	203.018.092.81
VLAN22	203.018.092.96	28	203.018.092.111	203.018.092.98 - 203.018.092.110	203.018.092.97
VLAN24	203.018.092.112	30	203.018.092.115	203.018.092.114 - 203.018.092.114	203.018.092.113

Designan-se as sub-redes públicas do Horoscope da mesma maneira que se fez no Calendar.

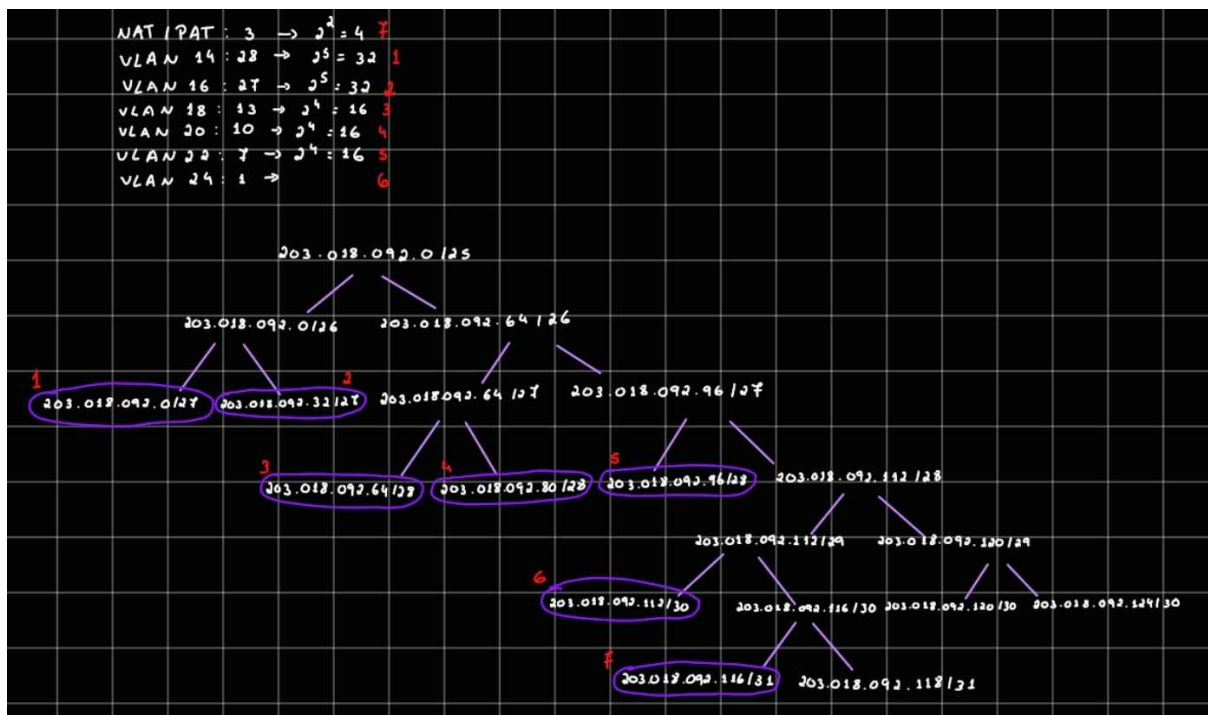


Figura 2: *Public IPv4 - Horoscope Inc*

## Private IPv4 sub-Networks

### *Calendar Inc*

	Network	Mask	Broadcast	Range	Gateway
<b>VLAN2</b>	172.25.012.0	24	172.25.012.255	172.25.012.2 - 172.25.012.254	172.25.012.1
<b>VLAN4</b>	172.25.013.0	25	172.25.013.127	172.25.013.2 - 172.25.013.126	172.25.13.1
<b>VLAN6</b>	172.25.013.128	26	172.25.013.191	172.25.013.130 - 172.25.013.190	172.25.013.129
<b>VLAN8</b>	172.25.013.192	27	172.25.013.223	172.25.013.194 - 172.25.013.222	172.25.013.193
<b>VLAN12</b>	-	-	-	-	-

Analisando a quantidade de endereços IPv4 necessários para cada sub-rede privada do Calendar, é possível estabelecer uma máscara adequada, bem como o gateway e o intervalo de endereços destinado a cada VLAN. A rede privada em questão inicia no endereço 172.25.012.0 com uma máscara /23, o que disponibiliza 512 endereços IP a partir do 172.25.012.1. Assim, a soma dos endereços usados pelas 4 VLANs deve ser inferior a 512 para que caibam todos na rede privada do Calendar.

Por exemplo, a VLAN 6 exige 50 endereços, logo, a máscara ideal é /26, pois esta cobre 64 endereços. Dessa forma, 172.25.013.128 será o endereço da sub-rede, 172.25.013.129 será o gateway, e haverá 61 endereços restantes para uso. O mesmo processo é aplicado às restantes VLANs.

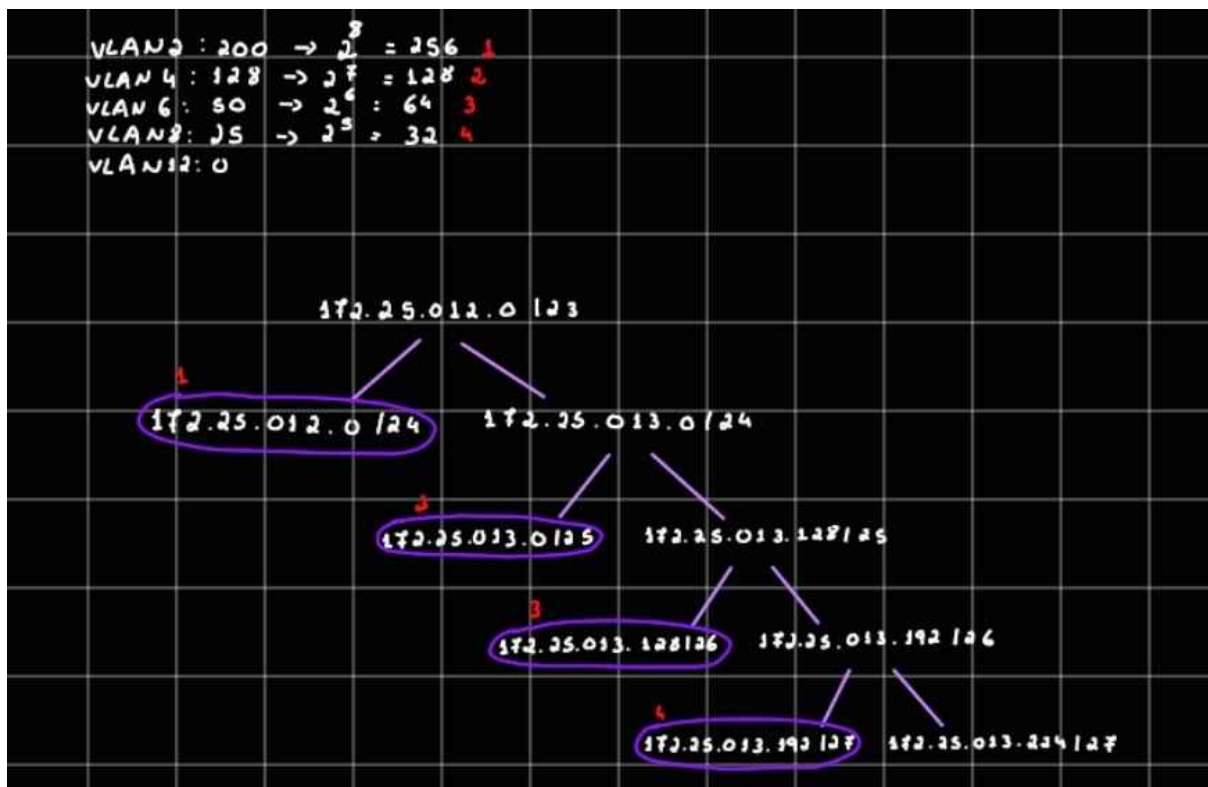


Figura 3: Private IPv4 - Calender Inc

#### Horoscope Inc

	Network	Mask	Broadcast	Range	Gateway
VLAN14	172.28.083.128	27	172.28.083.159	172.28.083.130 - 172.28.083.158	172.28.083.129
VLAN16	172.28.083.0	26	172.28.083.63	172.28.083.2 - 172.28.083.62	172.28.083.1
VLAN18	172.28.083.64	26	172.28.083.127	172.28.083.66 - 172.28.083.126	172.28.083.65
VLAN20	172.28.083.160	28	172.28.083.175	172.28.083.162 - 172.28.083.174	172.28.083.161
VLAN22	172.28.082.0	24	172.28.082.255	172.28.082.2 - 172.28.082.254	172.28.082.1
VLAN24	-	-	-	-	-

Designam-se as sub-redes privadas do Horoscope da mesma maneira que se fez no Calendar.

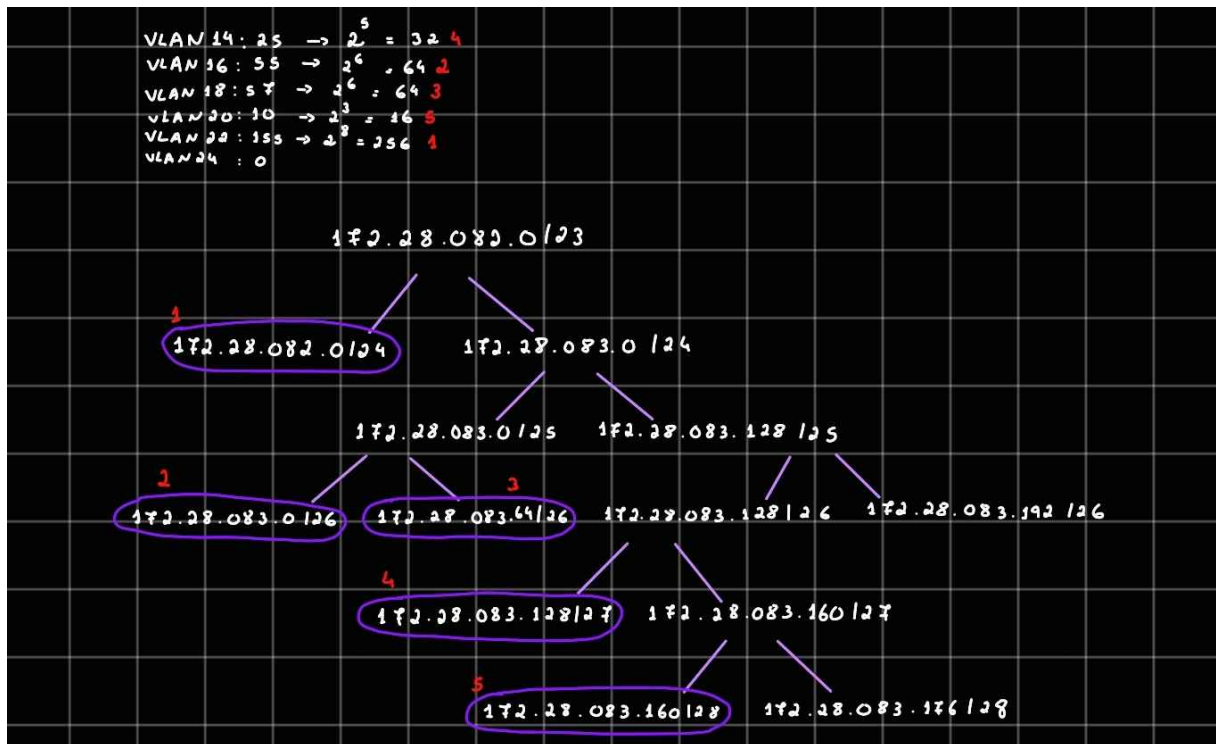


Figura 4: Private IPv4 - Horoscope Inc

## Global IPv6

*Calendar Inc*

Global IPv6 Network - 2002:A197:BC05::/48

	Network	Range	VLANs	Network	Range	Interconnection: router - ESWs
R2	2002:A197:BC05:100::/56	2002:a197:bc05:100:0:0:0:0	6	2002:A197:BC05:100::/64	2002:a197:bc05:100:0:0:0:0 2002:a197:bc05:100:ffff:ffff:ff:ffff	2002:A197:BC05::/126
		2002:a197:bc05:1ff:ffff:ffff:ffff:ff	8	2002:A197:BC05:101::/64	2002:a197:bc05:101:0:0:0:0 2002:a197:bc05:101:ffff:ffff:ff:ffff	
ESW2	2002:A197:BC05:200::/56	2002:a197:bc05:200:0:0:0:0	2	2002:A197:BC05:200::/64	2002:a197:bc05:200:0:0:0:0 2002:a197:bc05:200:ffff:ffff:ff:ffff	
		2002:a197:bc05:2ff:ffff:ffff:ffff:ff	4	2002:A197:BC05:201::/64	2002:a197:bc05:201:0:0:0:0 2002:a197:bc05:201:ffff:ffff:ff:ffff	
			12	2002:A197:BC05:202::/64	2002:a197:bc05:202:0:0:0:0 2002:a197:bc05:202:ffff:ffff:ff:ffff	

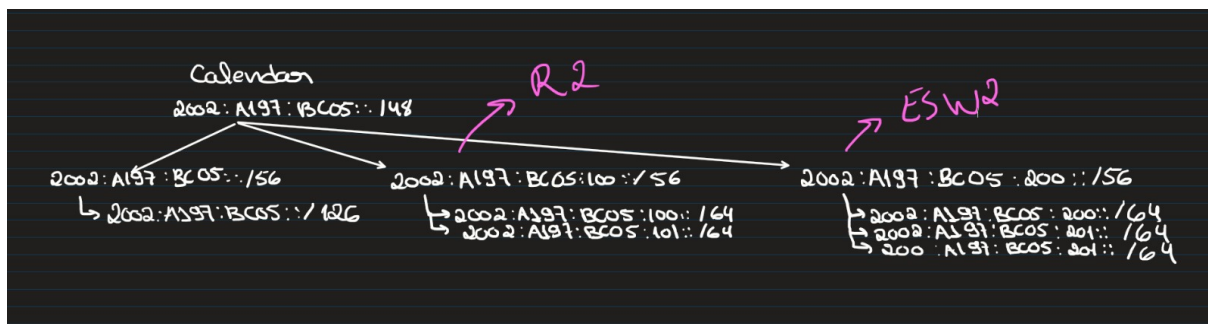


Figura 5: Global IPv6 - Calendar Inc

### Horoscope Inc

Global IPv6 Network - 2002:A189:BC28::/48

	Network	Range	VLANs	Network	Range	Interconnection: router - ESWs
<b>R1</b>	2002:A189:BC28:100::/56	2002:a189:bc28:100:0:0:0:0 2002:a189:bc28:1ff:ffff:ffff:ffff:ff	14	2002:A189:BC28:100::/64 4	2002:a189:bc28:100:0:0:0:0 2002:a189:bc28:100:ffff:ffff:ffff:ffff	2002:A189:BC28::/126
			16	2002:A189:BC28:101::/64	2002:a189:bc28:101:0:0:0:0 2002:a189:bc28:101:ffff:ffff:ffff:ffff	
			24	2002:A189:BC28:102::/56	2002:a189:bc28:102:0:0:0:0 2002:a189:bc28:102:ffff:ffff:ffff:ffff	
<b>ESW1</b>	2002:A189:BC28:200::/56	2002:a189:bc28:200:0:0:0:0 2002:a189:bc28:2ff:ffff:ffff:ffff:ff	18	2002:A189:BC28:200::/64	2002:a189:bc28:200:0:0:0:0 2002:a189:bc28:200:ffff:ffff:ffff:ffff	
			20	2002:A189:BC28:201::/64	2002:a189:bc28:201:0:0:0:0 2002:a189:bc28:201:ffff:ffff:ffff:ffff	
			22	2002:A189:BC28:202::/64	2002:a189:bc28:202:0:0:0:0 2002:a189:bc28:202:ffff:ffff:ffff:ffff	

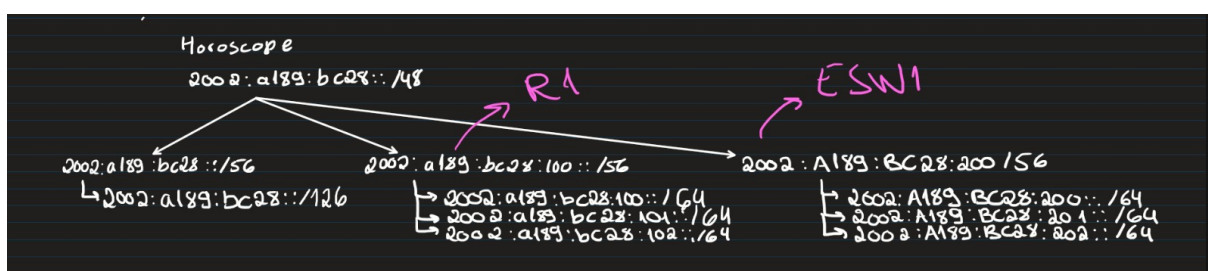


Figura 6: Global IPv6 - Horoscope Inc

## Inter-company and Internet Connectivity

- R1 Gigabit Ethernet interface 0/0 (g0/0) - 192.168.101.179/24
- R2 Gigabit Ethernet interface 0/0 (g0/0) - 192.168.101.179/224

## Rounting

- Classroom IP: 192.168.101.11
- Classroom IPv6 address: 2002:5755::1/64
- R1 IPv6 address g0/0 interface: 2002:5755::0297/64
- R1 IPv4 address g0/0 interface: 192.168.101.108/24
- R1 IPv4 address f1/0 interface: 172.25.013.225
- R1 IPv4 address f2/0 interface: 203.107.191.252
- R2 IPv6 address g0/0 interface: 2002:5755::0282/64
- R2 IPv4 address g0/0 interface: 192.168.101.179/24
- R2 IPv4 address f1/1 interface: 172.28.083.177
- R2 IPv4 address f2/1 interface: 203.018.092.116