

## Richtlijnen

### Projectopgave-2 Network Infrastructure 2 – 2021-2022

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#### Inleiding

In dit document vind je een overzicht van de verschillende configuraties die nodig zijn om project 2 uit te werken. De bedoeling van dit document is om min of meer een sequentieel verloop van het proces voor te stellen.

De bedoeling van dit document is zeer zeker **niet** om als enige input te dienen om de opgave uit te werken. Je zal zeer aandachtig de opgave moeten analyseren en interpreteren.

Deze richtlijn is opgebouwd uit vier fases:

1. Opbouw van het netwerk van ISP-1 en ISP-2.
2. Opbouw van het netwerk in site Gent.
3. Opbouw van het netwerk in site Antwerpen.
4. Uitrol van de services in de netwerken in Gent en Antwerpen.

#### Timing

Om te bepalen of je op schema zit kan je onderstaande als richtlijn gebruiken:

<b>Week 4</b>	Vanaf punt 1 t/m punt 12
<b>Week 5</b>	Vanaf punt 16 t/m punt 23
<b>Week</b>	Vanaf punt 13 t/m punt 15
<b>Week</b>	
<b>Week 6</b>	Vanaf punt 24 t/m punt 29

#### Voorbereiding

1. Geef alle toestellen de correcte hostname en zorg voor de overeenkomstige naam op de topologie zelf.

#### Fase 1 – ISP netwerk

2. Configureer de interfaces op ISP-1 en ISP-2.

```
Router(config)#int s0/1/1
Router(config-if)#ip address 20.45.20.1 255.255.255.252
Router(config-if)#no shut
Router(config-if)#exit
Router(config)#int s0/2/0
Router(config-if)#ip address 10.45.10.1 255.255.255.252
Router(config-if)#no shut
Router(config-if)#int g0/0/0
Router(config-if)#ip ad
```

```
Router(config-if)#ip address 209.165.80.1 255.255.252.0
```

```
Router(config-if)#no shut
```

3. Configureer BGP op ISP-1 en ISP-2.

```
ISP-1(config)#router bgp 65512
```

```
ISP-1(config-router)#network 10.45.10.0 mask 255.255.255.252
```

```
ISP-1(config-router)#network 20.45.20.0 mask 255.255.255.252
```

```
ISP-1(config-router)#network 209.165.80.0 mask 255.255.252.0
```

```
ISP-1(config-router)#neighbor 10.45.10.2 remote-as 65531
```

```
ISP-1(config-router)#exit
```

```
ISP-2(config)#router bgp 65531
```

```
ISP-2(config-router)#network 10.45.10.0 mask 255.255.255.252
```

```
ISP-2(config-router)#network 2.45.2.0 mask 255.255.255.252
```

```
ISP-2(config-router)#neig
```

```
ISP-2(config-router)#neighbor 10.45.10.1 remote-as 65512
```

```
ISP-2(config-router)#%BGP-5-ADJCHANGE: neighbor 10.45.10.1 Up
```

4. Test met een ping vanop ISP-2 naar de NTP server of alles correct werkt.

```
ISP-2#ping 209.165.80.2
```

```
Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echos to 209.165.80.2, timeout is 2 seconds:
```

```
!!!!
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/19/42 ms
```

```
ISP-2#
```

5. Test met een ping van Gent naar Antwerpen.

```
GENT#ping 2.45.2.1
```

```
Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echos to 2.45.2.1, timeout is 2 seconds:
```

```
!!!!
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 3/58/148 ms
```

```
GENT#
```

## Fase 2 – Gent netwerk

### OSPF

6. Bepaal de netwerken die je zal gebruiken voor de netwerken verbonden met R1, R2, R3 en R4. Hou hierbij rekening met het de vereiste om summarization te gebruiken.
7. Configureer op R5 een OSPF Area 0 en Area 1 en adverteer de nodige netwerken, inclusief de summary route. Zorg dat R5 DR is in Area 1.

```
R5(config)#router ospf 45
```

```
R5(config-router)#router-id 5.5.5.5
```

```
R5(config-router)#network 40.45.40.0 0.0.0.7 area 1
```

```
R5(config-router)#network 20.45.20.0 0.0.0.3 area 0
```

```
R5(config-router)#end
```

```
R5#sh ip ospf ne
R5#sh ip ospf neighbor
```

Neighbor ID	Pri	State	Dead Time	Address	Interface
4.4.4.4	1	FULL/BDR	00:00:30	40.45.40.5	GigabitEthernet0/0/0
2.2.2.2	1	FULL/DROTHER	00:00:30	40.45.40.3	GigabitEthernet0/0/0
3.3.3.3	1	FULL/DROTHER	00:00:37	40.45.40.4	GigabitEthernet0/0/0
1.1.1.1	1	FULL/DROTHER	00:00:37	40.45.40.2	GigabitEthernet0/0/0

R5#

8. Configureer op R1 t/m R4 de nodige OSPF instellingen en pas de OSPF reference bandwidth en de timers aan.

```
R1(config)#int g0/0/0
R1(config-if)#ip ospf he
R1(config-if)#ip ospf hello-interval 5
R1(config-if)#ip ospf dead-interval 20
```

```
R5(config)#router ospf 45
R5(config-router)#auto-cost reference-bandwidth 1000
% OSPF: Reference bandwidth is changed.
Please ensure reference bandwidth is consistent across all routers.
```

9. Configureer op R1 t/m R5 manueel een gateway of last resort.

```
R5#sh ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is 30.45.30.2 to network 0.0.0.0

20.0.0.0/30 is subnetted, 1 subnets
O 20.45.20.0/30 [110/128] via 30.45.30.2, 00:09:39, Serial0/1/0
30.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 30.45.30.0/30 is directly connected, Serial0/1/0
L 30.45.30.1/32 is directly connected, Serial0/1/0
40.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 40.45.40.0/29 is directly connected, GigabitEthernet0/0/0
L 40.45.40.1/32 is directly connected, GigabitEthernet0/0/0
192.45.1.0/30 is subnetted, 1 subnets
O 192.45.1.0/30 [110/2] via 40.45.40.2, 00:09:19, GigabitEthernet0/0/0
192.45.2.0/30 is subnetted, 1 subnets
O 192.45.2.0/30 [110/2] via 40.45.40.3, 00:09:19, GigabitEthernet0/0/0
192.45.3.0/30 is subnetted, 1 subnets
O 192.45.3.0/30 [110/2] via 40.45.40.4, 00:09:19, GigabitEthernet0/0/0
192.45.4.0/30 is subnetted, 1 subnets
O 192.45.4.0/30 [110/2] via 40.45.40.5, 00:09:19, GigabitEthernet0/0/0
S* 0.0.0.0/0 [1/0] via 30.45.30.2
```

10. Configureer op Gent OSPF en een gateway of last resort

```
GENT#sh ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is 20.45.20.1 to network 0.0.0.0

20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 20.45.20.0/30 is directly connected, Serial0/1/1
L 20.45.20.2/32 is directly connected, Serial0/1/1
30.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 30.45.30.0/30 is directly connected, Serial0/1/0
L 30.45.30.2/32 is directly connected, Serial0/1/0
40.0.0.0/29 is subnetted, 1 subnets
O IA 40.45.40.0/29 [110/65] via 30.45.30.1, 00:10:21, Serial0/1/0
192.45.1.0/30 is subnetted, 1 subnets
O IA 192.45.1.0/30 [110/66] via 30.45.30.1, 00:09:51, Serial0/1/0
192.45.2.0/30 is subnetted, 1 subnets
O IA 192.45.2.0/30 [110/66] via 30.45.30.1, 00:09:51, Serial0/1/0
192.45.3.0/30 is subnetted, 1 subnets
O IA 192.45.3.0/30 [110/66] via 30.45.30.1, 00:09:51, Serial0/1/0
192.45.4.0/30 is subnetted, 1 subnets
O IA 192.45.4.0/30 [110/66] via 30.45.30.1, 00:09:51, Serial0/1/0
S* 0.0.0.0/0 [1/0] via 20.45.20.1
```

## NAT

11. Maak de configuraties die nodig zijn voor Nat op router Gent.

```
GENT(config)#ip nat inside source list 30 interface s0/1/1 overload
GENT(config)#int s0/1/1
GENT(config-if)#ip nat out
GENT(config-if)#ip nat outside
GENT(config-if)#exit
GENT(config)#int s0/1/0
GENT(config-if)#ip nat inside
GENT(config-if)#exit
GENT(config)#access-list 30 permit 192.45.0.0 0.0.255.255
```

12. Test met een ping van PC1 naar de NTP server.

```
C:\>ping 209.165.80.2

Pinging 209.165.80.2 with 32 bytes of data:

Reply from 209.165.80.2: bytes=32 time=23ms TTL=124
Reply from 209.165.80.2: bytes=32 time=10ms TTL=124
Reply from 209.165.80.2: bytes=32 time=34ms TTL=124
Reply from 209.165.80.2: bytes=32 time=2ms TTL=124

Ping statistics for 209.165.80.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 34ms, Average = 17ms
```

```
GENT#sh ip nat translations
Pro Inside global      Inside local      Outside local      Outside global
icmp 20.45.20.2:13      192.45.1.2:13     209.165.80.2:13   209.165.80.2:13
icmp 20.45.20.2:14      192.45.1.2:14     209.165.80.2:14   209.165.80.2:14
icmp 20.45.20.2:15      192.45.1.2:15     209.165.80.2:15   209.165.80.2:15
icmp 20.45.20.2:16      192.45.1.2:16     209.165.80.2:16   209.165.80.2:16
```

## IPSeC

13. Bouw de GRE tunnel.

```
GENT(config)#int tunnel 0
GENT(config-if)#tunnel mode gre ip
GENT(config-if)#ip address 172.45.31.1 255.255.255.252
GENT(config-if)#tunnel source s0/1/1
GENT(config-if)#tunnel destination 2.45.2.1
GENT(config)#router ospf 10
GENT(config-router)#network 172.45.31.0 0.0.0.3 area 0
GENT(config-router)#end
```

14. Zorg dat Gent en Antwerpen OSPF neighbors worden en dat Gent via Antwerpen met OSPF updates het netwerk 50.x.50.0/24 kent. Test met een ping van PC1 naar de AAA server.

```
C:\>ping 50.45.50.2

Pinging 50.45.50.2 with 32 bytes of data:

Reply from 50.45.50.2: bytes=32 time=110ms TTL=122
Reply from 50.45.50.2: bytes=32 time=4ms TTL=122
Reply from 50.45.50.2: bytes=32 time=40ms TTL=122
Reply from 50.45.50.2: bytes=32 time=4ms TTL=122

Ping statistics for 50.45.50.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 4ms, Maximum = 110ms, Average = 39ms

C:\>
```

```
Antwerp(config)#int tunnel 0
Antwerp(config-if)#ip address 172.45.31.2 255.255.255.252
Antwerp(config-if)#tunnel mode gre ip
Antwerp(config-if)#tunnel source s0/1/1
Antwerp(config-if)#tunnel destination 20.45.20.2
Antwerp(config-if)#exit
Antwerp(config)#router ospf 10
Antwerp(config-router)#network 172.45.31.0 0.0.0.3 area 0
Antwerp(config-router)#network 50.45.50.0 0.0.0.255 area 0
Antwerp(config-router)#end
```

#### 15. Bouw de IPsec tunnel.

```
GENT(config)#crypto isakmp policy 1
GENT(config-isakmp)#encr aes 256
GENT(config-isakmp)#authentication pre-share
GENT(config-isakmp)#group 2

GENT(config)#crypto isakmp key AKINDELE address 2.45.2.1

GENT(config)#ip access-list extended IPSEC
GENT(config-ext-nacl)#remark vpn control
GENT(config-ext-nacl)#permit ip host 20.45.20.2 host 2.45.2.1

GENT(config)#crypto ipsec transform-set GRE esp-aes esp-sha-hmac

GENT(config)#crypto map CMAP 1 ipsec-isakmp
% NOTE: This new crypto map will remain disabled until a peer
and a valid access list have been configured.
GENT(config-crypto-map)#description vpn to antwerp
GENT(config-crypto-map)#set peer 2.45.2.1
GENT(config-crypto-map)#set transform-set GRE
GENT(config-crypto-map)#match address IPSEC
GENT(config-crypto-map)#exit
```

## Fase 3 – Antwerpen netwerk

16. Maak op ML-01-A, ML-02-A, SW-01-A en SW-02-A de nodige VLAN's, etherchannels, trunks en access poorten aan.

```
Switch(config)#int f0/24
Switch(config-if)#switchport access vlan 100
Switch(config-if)#switchport mode access
```

17. Configureer STP op ML-01-A en ML-02-A.
18. Activeer HSRP op ML-01-A en ML-02-A.

```
Switch(config)#int vlan 100
Switch(config-if)#ip address 172.45.16.1 255.255.255.0
Switch(config-if)#standby version 2
Switch(config-if)#standby 1 ip 172.45.16.254
Switch(config-if)#standby 1 preempt
Switch(config-if)#standby 1 priority 150
Switch(config-if)#exit
Switch(config)#int vlan 200
Switch(config-if)#ip address 172.45.25.1 255.255.255.0
Switch(config-if)#standby version 2
Switch(config-if)#standby 2 ip 172.45.25.254
Switch(config-if)#end
```

19. Test met een ping van Room-016 naar Room-025.

```
C:\>ping 172.45.25.3

Pinging 172.45.25.3 with 32 bytes of data:

Reply from 172.45.25.3: bytes=32 time<1ms TTL=127
Reply from 172.45.25.3: bytes=32 time=24ms TTL=127
Reply from 172.45.25.3: bytes=32 time<1ms TTL=127
Reply from 172.45.25.3: bytes=32 time<1ms TTL=127

Ping statistics for 172.45.25.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 24ms, Average = 6ms
```

20. Zorg ervoor dat router Antwerpen, R11, ML-01-A en ML-02-A OSPF neighbors worden en adverteer de nodige netwerken.
21. Test met een ping van Room-016 naar router Antwerpen.
22. Op router Antwerpen is er een default route die in OSPF wordt geïnjecteerd.
23. Configureer NAT op router Antwerpen en test met een ping van Room-016 naar de NTP server.

```
Antwerp(config)#ip nat inside source list 1 interface serial 0/1/1 overload
Antwerp(config)#access-list 1 permit 172.45.16.0 0.0.0.255
Antwerp(config)#access-list 1 permit 172.45.25.0 0.0.0.255
```

```

Antwerp(config)#int s0/1/0
Antwerp(config-if)#ip nat inside
Antwerp(config)#int s0/1/1
Antwerp(config-if)#ip nat out
Antwerp(config-if)#ip nat outside
  
```

```

Antwerp#sh ip nat translations
Pro  Inside global      Inside local      Outside local      Outside global
icmp 2.45.2.1:13        172.45.16.3:13    209.165.80.2:13    209.165.80.2:13
icmp 2.45.2.1:14        172.45.16.3:14    209.165.80.2:14    209.165.80.2:14
  
```

## Fase 4 – Gent & Antwerpen Services

### Antwerpen

#### 24. NTP:

- Maak de instelling zodat router Antwerpen gebruik maakt van NTP-SRV voor tijdsynchronisatie.

```

ISP-1(config)#ntp authentication-key 1 md5 Akindele
ISP-1(config)#ntp authenticate
ISP-1(config)#ntp trusted-key 1
ISP-1(config)#ntp server 209.165.80.2
ISP-1(config)#
  
```

```

ISP-2(config)#ntp authentication-key 1 md5 Akindele
ISP-2(config)#ntp authenticate
ISP-2(config)#ntp trusted-key 1
ISP-2(config)#ntp server 209.165.80.2
ISP-2(config)#end
  
```

```

Antwerp(config)#ntp authentication-key 1 md5 Akindele
Antwerp(config)#ntp authenticate
Antwerp(config)#ntp trusted-key 1
Antwerp(config)#ntp server 209.165.80.2
Antwerp(config)#ntp master ?
<1-15> Act as NTP master clock
<cr>
Antwerp(config)#ntp master 2
  
```

- Maak de instelling zodat alle andere netwerktoestellen in de site Antwerpen hun systeemklok synchroniseren met router Antwerpen.

```

R11(config)#ntp server 60.45.60.1
R11#sh clock detail
0:15:41.929 UTC Mon Mar 1 1993
  
```

Time source is NTP

```
MIL02-AE(config)#ntp server 60.45.60.1
MIL02-AE(config)#end
```

```
MIL-01AE(config)#ntp server 60.45.60.1
MIL-01AE(config)#end
```

## 25. SPAN:

- Plaats een sniffer gekoppeld aan SW-02-A en maak de nodige configuraties.

```
SW02-AE(config)#monitor session 1 source int f0/24
SW02-AE(config)#monitor session 1 destination int f0/20
SW02-AE(config)#end
SW02-AE#sh monitor session local
Session 1
-----
```

```
Type : Local Session
Description : -
Source Ports :
Both : Fa0/24
Destination Ports : Fa0/20
Encapsulation : Native
Ingress : Disabled
```

```
SW02-AE(config)#monitor session 1 source vlan 200 tx
SW02-AE(config)#monito
SW02-AE(config)#monitor session 1 destination in
SW02-AE(config)#monitor session 1 destination interface f0/20
SW02-AE(config)#
```

## Gent

## 26. Upgrade:

- Voer de gevraagde upgrade uit met de image te vinden op de Monitor server.

```
Switch#copy tftp flash
Address or name of remote host []? 192.45.4.2
Source filename []? c2960-lanbasek9-mz.150-2.SE4.bin
Destination filename [c2960-lanbasek9-mz.150-2.SE4.bin]?

Accessing tftp://192.45.4.2/c2960-lanbasek9-mz.150-2.SE4.bin...
Loading c2960-lanbasek9-mz.150-2.SE4.bin from 192.45.4.2:
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
[OK - 4670455 bytes]

4670455 bytes copied in 0.118 secs (3182099 bytes/sec)
Switch#
```



```

The password-recovery mechanism is enabled.
64K bytes of flash-simulated non-volatile configuration memory.
Base ethernet MAC Address       : 00:17:59:A7:51:80
Motherboard assembly number     : 73-10390-03
Power supply part number        : 341-0097-02
Motherboard serial number       : FOC10093R12
Power supply serial number      : AZS1007032H
Model revision number           : B0
Motherboard revision number     : B0
Model number                    : WS-C2960-24TT-L
System serial number            : FOC1010X104
Top Assembly Part Number        : 800-27221-02
Top Assembly Revision Number    : A0
Version ID                      : V02
CLEI Code Number                : COM3L00BRA
Hardware Board Revision Number  : 0x01

Switch Ports Model          SW Version  SW Image
-----
*    1 26    WS-C2960-24TT-L  15.0(2)SE4  C2960-LANBASEK9-M

Cisco IOS Software, C2960 Software (C2960-LANBASEK9-M), Version 15.0(2)SE4, RELEASE SOFTWARE
(fc1)

```

## 27. SDN controller:

- Plaats een controller gekoppeld aan SW-02-G.
- Voorzie de controller van netwerkinstellingen.
- Test met een ping vanaf een PC naar de controller.
- Surf naar de webinterface en maak het gebruikersaccount aan.

```

R4(config)#ip domain name admin
R4(config)#crypto key generate rsa
The name for the keys will be: R4.admin
Choose the size of the key modulus in the range of 360 to 2048 for your
General Purpose Keys. Choosing a key modulus greater than 512 may take
a few minutes.

```

```

How many bits in the modulus [512]: 1024
% Generating 1024 bit RSA keys, keys will be non-exportable...[OK]

```

```

R4(config)#ip ssh version 2
*Mar 1 0:35:3.343: %SSH-5-ENABLED: SSH 1.99 has been enabled
R4(config)#username ezekiel password cisco123
R4(config)#line vty 0 15
R4(config-line)#transport input ssh
R4(config-line)#login local
R4(config-line)#

```

- Doe een discovery van het netwerk waarbij je start vanaf R1. Verwijder alle overbodige toestellen uit de interface.

NETWORK DEVICE

DISCOVERY

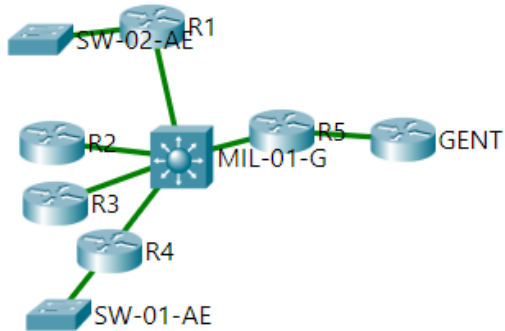
CREDENTIALS

Network Device

+ DEVICE

	Hostname	Type	IP	Up Time	Last Updated	Colle
	R1	Router	40.45.40.2	51 minutes, 43 seconds	2022-01-04 11:53:42	Mane
	R2	Router	40.45.40.3	51 minutes, 43 seconds	2022-01-04 11:53:42	Mane
	SW-02-AE	Switch	192.45.1.3	25 minutes, 23 seconds	2022-01-04 11:53:42	Mane
	R3	Router	40.45.40.4	51 minutes, 43 seconds	2022-01-04 11:53:42	Mane
	R4	Router	40.45.40.5	51 minutes, 43 seconds	2022-01-04 11:53:42	Mane
	R5	Router	40.45.40.1	51 minutes, 43 seconds	2022-01-04 11:53:42	Mane
	GENT	Router	30.45.30.2	51 minutes, 43 seconds	2022-01-04 11:53:42	Mane
	SW-01-AE	Switch	192.45.4.3	36 minutes, 33 seconds	2022-01-04 11:53:42	Mane
	MIL-01-G	MultiLayerSwitch	40.45.40.6	51 minutes, 43 seconds	2022-01-04 11:53:42	Mane

Topology



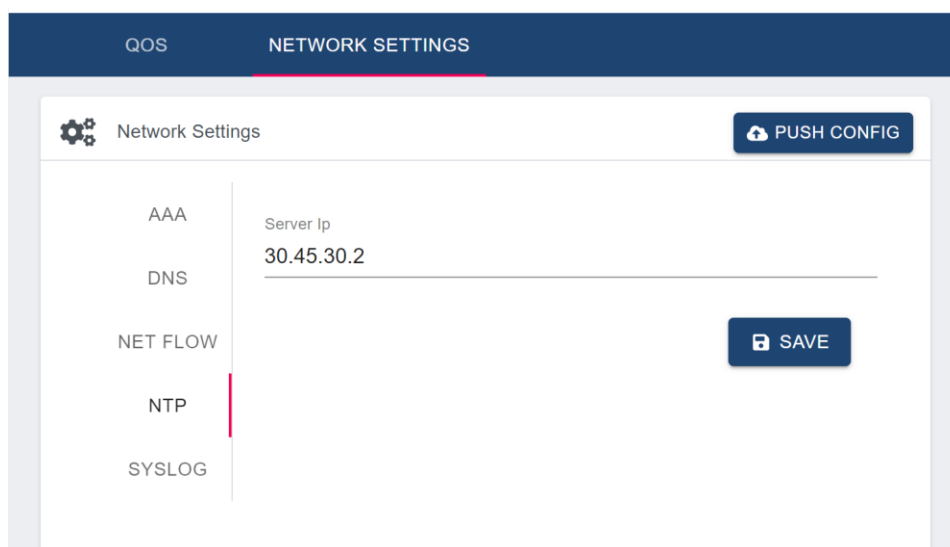
## 28. NTP:

- Maak de instelling zodat router Gent gebruik maakt van NTP-SRV voor tijdsynchronisatie.

```
GENT(config)#ntp authenticate
GENT(config)#ntp trusted-key 1
GENT(config)#ntp server 209.165.80.2
GENT(config)#ntp master 3
GENT(config)#end
GENT#
%SYS-5-CONFIG_I: Configured from console by console
```

```
GENT#sh clock de
GENT#sh clock detail
0:54:46.265 UTC Mon Mar 1 1993
Time source is NTP
GENT#
```

- Gebruik de controller om naar alle andere netwerktoestellen in site Gent de configuraties te pushen die ervoor zorgen dat ze synchroniseren met router Gent.



## 29. NetFlow – Syslog – AAA – SNMP - QoS:

- Maak de gevraagde instellingen.

### NETFLOW

```
R5(config)#flow record Akindele-OUTBOUND
R5(config-flow-record)#match ipv4 destination address
R5(config-flow-record)#match transport destination-port
R5(config-flow-record)#collect counter bytes
R5(config-flow-record)#collect counter packets
R5(config-flow-record)#collect timestamp sys-uptime first
R5(config-flow-record)#collect timestamp sys-uptime last
R5(config-flow-record)#
```

```
R5(config)#flow exporter export-host
R5(config-flow-exporter)#destination 192.45.4.2
R5(config-flow-exporter)#export-protocol netflow-v9
R5(config-flow-exporter)#transport UDP 9996
R5(config-flow-exporter)#exit
```


```
R5(config)#flow monitor export-monitor
R5(config-flow-monitor)#record Akindele-OUTBOUND
R5(config-flow-monitor)#exporter export-host
R5(config-flow-monitor)#
```


```
R5(config)#int g0/0/0
R5(config-if)#ip flow monitor export-monitor output
R5(config-if)#ip flow monitor export-monitor input
R5(config-if)#
```


## QUALITY OF SERVICE


URL http://192.45.1.4 Go Stop

QOS NETWORK SETTINGS

 Scope + SCOPE

Scope Name	Device Name	Device IP
 ezekiel_voip	R2	40.45.40.3
	R3	40.45.40.4
	ML-01-G	40.45.40.6

 Policy + POLICY

Policy Name	Relevance Level	Protocol	Scope
 ezekiel_voipPolicy	Business-Relevant	UDP SCCP RTP H.323	ezekiel_voip

## SNMP

```
R5(config)#snmp-server community public-akindele RO
%SNMP-5-WARMSTART: SNMP agent on host R5 is undergoing a warm start
R5(config)#snmp-server community private-akindele RW
R5(config)#
```

```
interface Loopback0
 ip address 1.1.1.1 255.255.255.0
```

Physical Config Services **Desktop** Programming Attributes

**MIB Browser** [X]

Address:       OID:

     Operations:

SNMP MIBs

- ▼ MIB Tree
  - ▼ router\_std MIBs
    - ▼ .iso
      - ▼ .org
        - ▼ .dod
          - ▼ .internet
            - ▼ .mgmt
              - ▼ .mib-2
                - ▼ .system
                  - .sysDe...
                  - .sysObj...
                  - .sysUp...
                  - .sysCo...

Result Table

| Name/OID                                     | Value | Type        |
|--|-------|-------------|
| .1.3.6.1.2.1.1.5.0<br>(.iso.org.dod.inter... | R5    | OctetString |

**AAAA**

R5(config)#radius-server host 50.45.50.2 auth-port 1812 key ezekiel

R5(config)#aaa new-model

R5(config)#aaa authentication login AAACON group radius enable

R5(config)#aaa authentication login AAAEXT group radius none

R5(config)#line console 0

R5(config-line)#login authentication AAACON

R5(config-line)#exit

R5(config)#line vty 0 4

R5(config-line)#login authentication AAAEXT

R5(config-line)#exit.

R5(config)#line vty 5 15

R5(config-line)#login authentication AAAEXT

R5(config-line)#

Service ☒ On ☐ Off Radius Port

---

Network Configuration

Client Name  Client IP

Secret  ServerType Radius

|   | Client Name | Client IP  | Server Type | Key     |
|---|-------------|------------|-------------|---------|
| 1 | SW-01-G     | 192.45.4.3 | Radius      | ezeziel |
| 2 | R5          | 30.45.30.1 | Radius      | ezeziel |
| 3 | R1          | 40.45.40.2 | Radius      | ezeziel |
| 4 | R2          | 40.45.40.3 | Radius      | ezeziel |

Add Save Remove

---


User Setup

Username  Password

|   | Username     | Password |
|---|--------------|----------|
| 1 | RAD-akindele | cisco123 |

Add

## SYSLOG

 Network Settings PUSH CONFIG

AAA  
DNS  
NET FLOW  
NTP  
SYSLOG

- +

Server Ip (1)  
192.45.4.2

SAVE

**R5(config)#service timestamps log datetime msec**