

Progettazione e Configurazione di una Rete VLAN su GNS3

Obiettivi del Progetto

Progettare e configurare una rete in GNS3 che includa due LAN separate in due VLAN. Implementare il routing inter-VLAN per permettere la comunicazione tra le VLAN.

Concetti di Base

Il routing inter-VLAN consente l'inoltro di pacchetti tra host appartenenti a VLAN diverse. Ogni VLAN necessita di un gateway, configurato tramite sub-interface sul router, che consenta la comunicazione tra reti distinte.

Configurazione delle LAN

Sono stati posizionati 4 PC e assegnati indirizzi IP e gateway secondo le subnet:

- VLAN 10: 192.168.1.1/24 e 192.168.1.2/24

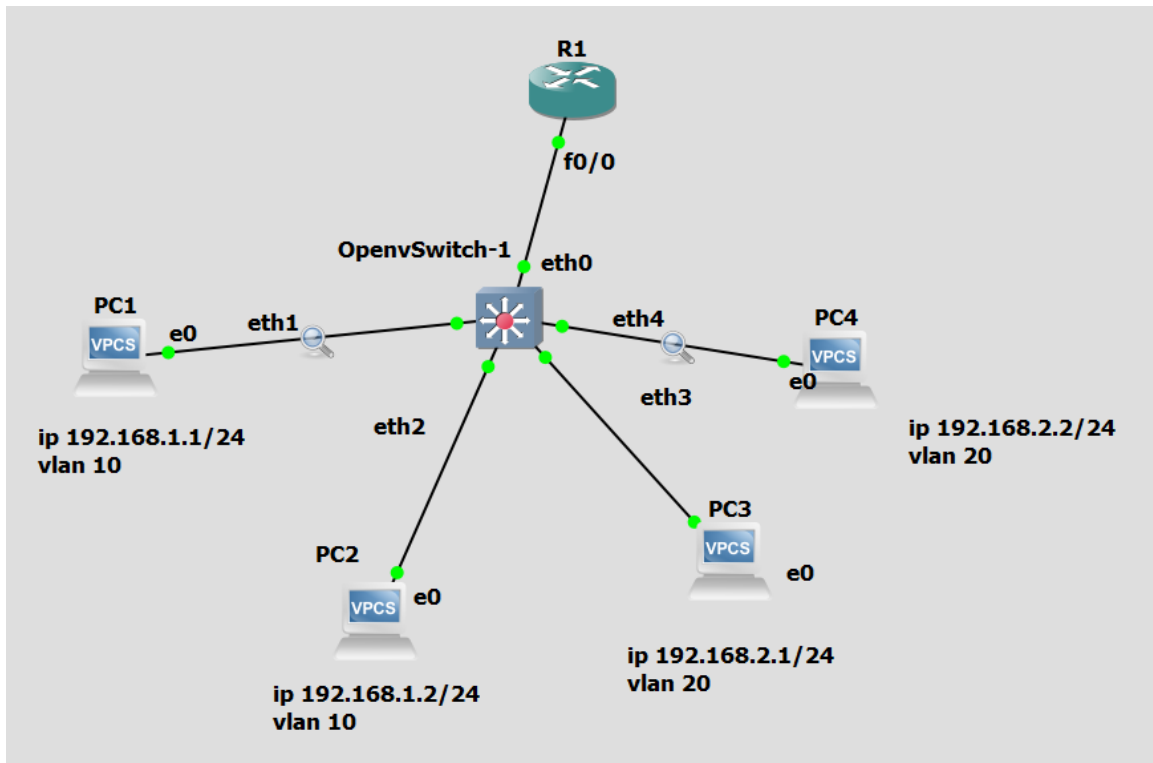
- VLAN 20: 192.168.2.1/24 e 192.168.2.2/24

```
PC1> ip 192.168.1.1 255.255.255.0 gateway 192.168.1.10
Checking for duplicate address...
PC1 : 192.168.1.1 255.255.255.0 gateway 192.168.1.10
```

```
PC2> ip 192.168.1.2 255.255.255.0 gateway 192.168.1.10
Checking for duplicate address...
PC1 : 192.168.1.2 255.255.255.0 gateway 192.168.1.10
```

```
PC3> ip 192.168.2.1 255.255.255.0 gateway 192.168.2.10
Checking for duplicate address...
PC1 : 192.168.2.1 255.255.255.0 gateway 192.168.2.10
```

```
PC4> ip 192.168.2.2 255.255.255.0 gateway 192.168.2.10
Checking for duplicate address...
PC1 : 192.168.2.2 255.255.255.0 gateway 192.168.2.10
```



Configurazione dello Switch

Problemi Iniziali

1. Switch Built-in di GNS3: Non supporta trunking e configurazione VLAN.

- Permette solo l'assegnazione di VLAN ID alle porte.
- Configurazione insufficiente per il routing inter-VLAN.

The screenshot shows the 'Node properties' dialog box for 'Switch1 configuration'. The dialog is divided into two main sections: 'General' and 'Settings'.

General Section:

- Name: Switch1
- Console type: none

Settings Section:

- Port: 8
- VLAN: 1
- Type: access
- QinQ EtherType: 0x8100

Ports Table:

Port	VLAN	Type
0	1	access
1	1	access
2	1	access
3	1	access
4	1	access

At the bottom of the dialog, there are buttons for 'Add', 'Delete', 'Reset', 'OK', 'Cancel', and 'Apply'.

2. Router c3725 come EtherSwitch Router:

- Comandi VLAN limitati alla creazione di VLAN ID tramite `vlan database`.
- Mancanza della funzionalità di riassegnare VLAN alle porte.

```
*****
This is a normal Router with a SW module inside (NM-16ESW)
It has been preconfigured with hard coded speed and duplex

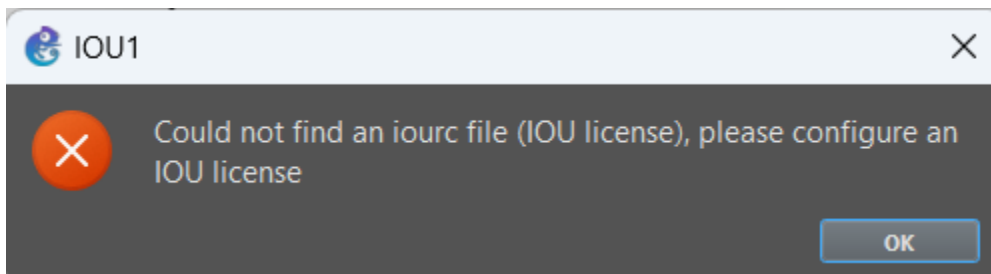
To create vlans use the command "vlan database" from exec mode
After creating all desired vlans use "exit" to apply the config

To view existing vlans use the command "show vlan-switch brief"

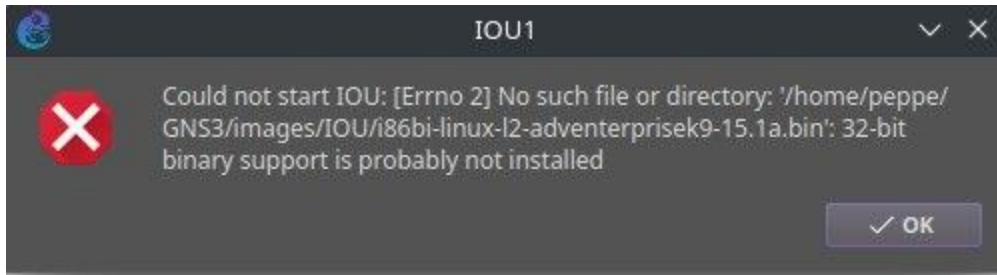
Warning: You are using an old IOS image for this router.
Please update the IOS to enable the "macro" command!
*****
```

3. Switch del Materiale di Supporto:

- Richiede licenza generata tramite script Python.
- Problemi con script incompatibile con l'attuale versione di Python.
- File `lib` a 32-bit incompatibile con il sistema utilizzato.



```
[peppe@giuseppe-mclfx Materiale a Supporto-20241210]$ ./CiscoKeyGen.py
*****
Cisco IOU License Generator - Kal 2011, python port of 2006 C version
hostid=007f0101, hostname=giuseppe-mclfx, ioukey=7f0722
Traceback (most recent call last):
  File "/home/peppe/Scaricati/Materiale a Supporto-20241210/./CiscoKeyGen.py", line 19, in <module>
    md5input = iouPad1 + iouPad2 + struct.pack("!!L", ioukey) + iouPad1
    ~~~~~^~~~~~
TypeError: can only concatenate str (not "bytes") to str
```



4. Soluzione Finale: Utilizzo di OpenVSwitch, router open source nel marketplace GNS3.

Configurazione delle Porte

```
# ovs-vsctl set port eth1 tag=10
```

```
# ovs-vsctl set port eth2 tag=10
```

```
# ovs-vsctl set port eth3 tag=20
```

```
# ovs-vsctl set port eth4 tag=20
```

Configurazione Trunk

Per configurare il trunk:

```
# ovs-vsctl set port eth5 trunks=10,20
```

Configurazione generale:

```
# ovs-vsctl show
```

```
Port eth2
    tag: 10
    Interface eth2
Port eth4
    tag: 20
    Interface eth4
Port eth3
    tag: 20
    Interface eth3
```

```
Port eth0
    trunks: [10, 20]
    Interface eth0
```

```
Port eth1
    tag: 10
    Interface eth1
```

Configurazione del Router

Per abilitare il routing inter-VLAN senza necessitare di un'interfaccia fisica per ogni VLAN, si utilizzano sub-interfaces. Ogni sub-interface rappresenta una VLAN distinta e viene configurata con un ID VLAN specifico tramite encapsulation 802.1Q.

Configurazione dell'interfaccia principale:

```
Router(config)#interface fa0/0
```

```
Router(config-if)#no ip address
```

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

Creazione di sub-interface per VLAN 10 e 20:

```
Router(config)#interface fa0/0.10
```

```
Router(config-subif)#encapsulation dot1q 10
```

```
Router(config-subif)#ip address 192.168.1.10 255.255.255.0
```

```
Router(config)#interface fa0/0.20
```

```
Router(config-subif)#encapsulation dot1q 20
```

```
Router(config-subif)#ip address 192.168.2.10 255.255.255.0
```

```
R1#sh ip int br
```

Interface	IP-Address	OK?	Method	Status	Protocol
FastEthernet0/0	unassigned	YES	NVRAM	up	up
FastEthernet0/0.1	10.1.1.254	YES	NVRAM	up	up
FastEthernet0/0.2	10.1.2.254	YES	NVRAM	up	up
FastEthernet0/0.10	192.168.1.10	YES	NVRAM	up	up
FastEthernet0/0.20	192.168.2.10	YES	NVRAM	up	up
Serial0/0	unassigned	YES	NVRAM	administratively down	down
FastEthernet0/1	unassigned	YES	NVRAM	administratively down	down
Serial0/1	unassigned	YES	NVRAM	administratively down	down
Serial0/2	unassigned	YES	NVRAM	administratively down	down
Serial0/3	unassigned	YES	NVRAM	administratively down	down
FastEthernet1/0	unassigned	YES	NVRAM	administratively down	down

Dimostrazione funzionamento rete

The image displays two screenshots of a network simulation environment, likely OpenSwitch-1, showing network connectivity tests.

Left Screenshot (Terminal Output):

```
Welcome to Virtual PC Simulator, version 0.6.2
Dedicated to Dalling.
Build time: Apr 10 2019 02:42:20
Copyright (c) 2007-2014, Paul Meng (mirnsh@gmail.com)
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Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

Checking for duplicate address...
PCI : 192.168.1.1 255.255.255.0 gateway 192.168.1.10

PCI> ping 192.168.2.2
192.168.2.2 icmp_seq=1 timeout
192.168.2.2 icmp_seq=2 timeout
84 bytes from 192.168.2.2 icmp_seq=3 ttl=63 time=18.204 ms
84 bytes from 192.168.2.2 icmp_seq=4 ttl=63 time=26.126 ms
84 bytes from 192.168.2.2 icmp_seq=5 ttl=63 time=16.772 ms

PCI> ping 192.168.2.2
84 bytes from 192.168.2.2 icmp_seq=1 ttl=63 time=11.807 ms
84 bytes from 192.168.2.2 icmp_seq=2 ttl=63 time=17.856 ms
84 bytes from 192.168.2.2 icmp_seq=3 ttl=63 time=23.551 ms
84 bytes from 192.168.2.2 icmp_seq=4 ttl=63 time=23.579 ms
84 bytes from 192.168.2.2 icmp_seq=5 ttl=63 time=34.801 ms

PCI> ping 192.168.2.2
84 bytes from 192.168.2.2 icmp_seq=1 ttl=63 time=26.927 ms
84 bytes from 192.168.2.2 icmp_seq=2 ttl=63 time=23.214 ms
```

Right Screenshot (Wireshark Capture):

The Wireshark capture shows packets received on the Standard input (PC4 Ethernet0 to OpenSwitch-1 eth4). The capture is filtered by "No. 1 0.000000".

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	fe80::42:dcff:fe6a::	ff02::2	ICMPv6	70	Router Solicitation from 0...
2	17.133917	192.168.1.1	192.168.2.2	ICMP	98	Echo (ping) request id=0x...
3	17.134113	192.168.2.2	192.168.1.1	ICMP	98	Echo (ping) reply id=0x...

The second capture shows packets received on the Standard input (PC4 Ethernet0 to OpenSwitch-1 eth4). The capture is filtered by "No. 2 0.026568".

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	192.168.1.1	192.168.2.2	ICMP	98	Echo (ping) request id=0x...
2	0.026568	192.168.2.2	192.168.1.1	ICMP	98	Echo (ping) reply id=0x...

Nome: Giuseppe Cognome: Marini Matricola: 0001091174.