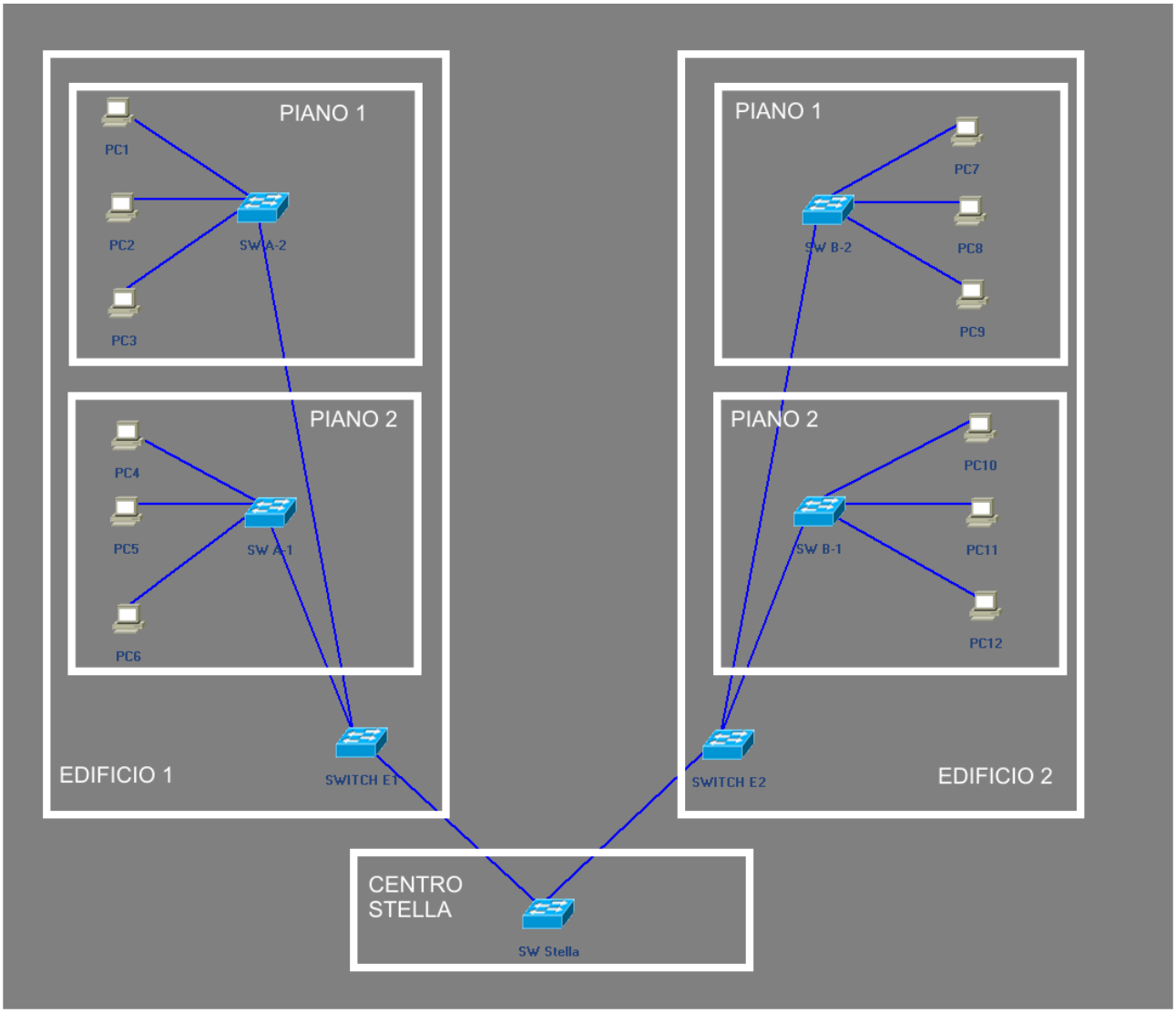
LEZIONE 2 – SWITCHING AVANZATO

ESERCIZIO N. 2.1 – SWITCHING DI UN EDIFICIO



DESCRIZIONE:

Si vuole costruire una rete, che si estende su due edifici, nella quale abbiamo uno switch centro stella al quale sono collegati due switch (uno per edificio); ad ognuno di questi si collegano due switch di piano ai quali colleghiamo rispettivamente 3 pc.

I pc stanno tutti sulla rete privata 192.168.1.0 255.255.255.0,
gli switch sulla stesse rete ma con indirizzi sopra il 192.168.1.200 255.255.255.0

Pc01: 192.168.1.10 - Pc02: 192.168.1.11 - Pc03: 192.168.1.12
Pc04: 192.168.1.13 - Pc05: 192.168.1.14 - Pc06: 192.168.1.15
Pc07: 192.168.1.16 - Pc08: 192.168.1.17 - Pc09: 192.168.1.18
Pc10: 192.168.1.19 - Pc11: 192.168.1.20 - Pc12: 192.168.1.21

SW Stella: 192.168.1.201 - Switch E1: 192.168.1.202 - Switch E2: 192.168.1.203
Switch A-1: 192.168.1.204 - Switch A-2: 192.168.1.205
Switch B-1: 192.168.1.206 - Switch B-2: 192.168.1.207

SOLUZIONE:

Configuriamo tutti gli ip dei PC, poi tramite il comando ping testiamo che tutti i PC siano raggiungibili dal PC01

```
C:>ping 192.168.1.11

Pinging 192.168.1.11 with 32 bytes of data:

Reply from 192.168.1.11 on Eth, time<10ms TTL=128
Reply from 192.168.1.11 on Eth, time<10ms TTL=128
Reply from 192.168.1.11 on Eth, time<10ms TTL=128
Reply from 192.168.1.11 on Eth, time<10ms TTL=128
```

```
C:>ping 192.168.1.12

Pinging 192.168.1.12 with 32 bytes of data:

Reply from 192.168.1.12 on Eth, time<10ms TTL=128
Reply from 192.168.1.12 on Eth, time<10ms TTL=128
Reply from 192.168.1.12 on Eth, time<10ms TTL=128
Reply from 192.168.1.12 on Eth, time<10ms TTL=128
```

```
C:>ping 192.168.1.13

Pinging 192.168.1.13 with 32 bytes of data:

Reply from 192.168.1.13 on Eth, time<10ms TTL=128
Reply from 192.168.1.13 on Eth, time<10ms TTL=128
Reply from 192.168.1.13 on Eth, time<10ms TTL=128
Reply from 192.168.1.13 on Eth, time<10ms TTL=128
```

```
C:>ping 192.168.1.14

Pinging 192.168.1.14 with 32 bytes of data:

Reply from 192.168.1.14 on Eth, time<10ms TTL=128
Reply from 192.168.1.14 on Eth, time<10ms TTL=128
Reply from 192.168.1.14 on Eth, time<10ms TTL=128
Reply from 192.168.1.14 on Eth, time<10ms TTL=128
```

```
C:>ping 192.168.1.15

Pinging 192.168.1.15 with 32 bytes of data:

Reply from 192.168.1.15 on Eth, time<10ms TTL=128
Reply from 192.168.1.15 on Eth, time<10ms TTL=128
Reply from 192.168.1.15 on Eth, time<10ms TTL=128
Reply from 192.168.1.15 on Eth, time<10ms TTL=128



C:>ping 192.168.1.16

Pinging 192.168.1.16 with 32 bytes of data:

Reply from 192.168.1.16 on Eth, time<10ms TTL=128
Reply from 192.168.1.16 on Eth, time<10ms TTL=128
Reply from 192.168.1.16 on Eth, time<10ms TTL=128
Reply from 192.168.1.16 on Eth, time<10ms TTL=128



C:>ping 192.168.1.17

Pinging 192.168.1.17 with 32 bytes of data:

Reply from 192.168.1.17 on Eth, time<10ms TTL=128
Reply from 192.168.1.17 on Eth, time<10ms TTL=128
Reply from 192.168.1.17 on Eth, time<10ms TTL=128
Reply from 192.168.1.17 on Eth, time<10ms TTL=128



C:>ping 192.168.1.18

Pinging 192.168.1.18 with 32 bytes of data:

Reply from 192.168.1.18 on Eth, time<10ms TTL=128
Reply from 192.168.1.18 on Eth, time<10ms TTL=128
Reply from 192.168.1.18 on Eth, time<10ms TTL=128
Reply from 192.168.1.18 on Eth, time<10ms TTL=128



C:>ping 192.168.1.19

Pinging 192.168.1.19 with 32 bytes of data:
```

```
Reply from 192.168.1.19 on Eth, time<10ms TTL=128
Reply from 192.168.1.19 on Eth, time<10ms TTL=128
Reply from 192.168.1.19 on Eth, time<10ms TTL=128
Reply from 192.168.1.19 on Eth, time<10ms TTL=128
```

```
C:>ping 192.168.1.20

Pinging 192.168.1.20 with 32 bytes of data:

Reply from 192.168.1.20 on Eth, time<10ms TTL=128
Reply from 192.168.1.20 on Eth, time<10ms TTL=128
Reply from 192.168.1.20 on Eth, time<10ms TTL=128
Reply from 192.168.1.20 on Eth, time<10ms TTL=128
```

```
C:>ping 192.168.1.21

Pinging 192.168.1.21 with 32 bytes of data:

Reply from 192.168.1.21 on Eth, time<10ms TTL=128
Reply from 192.168.1.21 on Eth, time<10ms TTL=128
Reply from 192.168.1.21 on Eth, time<10ms TTL=128
Reply from 192.168.1.21 on Eth, time<10ms TTL=128
```

CONFIGURAZIONE DELLA RETE DEGLI SWITCH

SW A-1

```
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#hostname SWA-1
SWA-1(config)#interface vlan1
SWA-1(config-if)#ip address 192.168.1.204 255.255.255.0
SWA-1(config-if)#no shutdown
SWA-1(config-if)#exit
%LDXX - Interface vlan 1, changed state to up
SWA-1(config)#exit
SWA-1#exit
```

SW A-2

```
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#hostname SWA-2
SWA-2(config)#interface vlan1
SWA-2(config-if)#ip address 192.168.1.205 255.255.255.0
SWA-2(config-if)#no shutdown
SWA-2(config-if)#exit
SWA-2(config)#exit
%LDXX - Interface vlan 1, changed state to up
SWA-2#exit
```

SW E1

```
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#hostname SWE1
SWE1(config)#interface vlan1
SWE1(config)# ip address 192.168.1.202 255.255.255.0
SWE1(config-if)#no shutdown
SWE1(config-if)#exit
SWE1(config)#exit
%LDXX - Interface vlan 1, changed state to up
SWE1#exit
```

SW Stella

```
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#hostname SWSTELLA
SWSTELLA(config)#interface vlan1
SWSTELLA(config-if)#ip address 192.168.1.201 255.255.255.0
SWSTELLA(config-if)#no shutdown
SWSTELLA(config-if)#exit
SWSTELLA(config)#exit
%LDXX - Interface vlan 1, changed state to up
```

```
SWSTELLA#exit
```

SW E2

```
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#hostname SWE2
SWE2(config)#interface vlan1
SWE2(config-if)#ip address 192.168.1.203 255.255.255.0
SWE2(config-if)#no shutdown
SWE2(config-if)#exit
SWE2(config)# exit
%LDXX - Interface vlan 1, changed state to up
SWE2#exit
```

SW B-1

```
Switch>enable
Switch#configure teminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#hostname SWB-1
SWB-1(config)#interface vlan1
SWB-1(config-if)#ip address 192.168.1.206 255.255.255.0
SWB-1(config-if)#no shutdown
SWB-1(config-if)#exit
SWB-1(config)#exit
%LDXX - Interface vlan 1, changed state to up
SWB-1#exit
```

SW B-2

```
Switch>enable
Switch#configure teminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#hostname SWB-2
SWB-2(config)#interface vlan1
SWB-2(config-if)#ip address 192.168.1.207 255.255.255.0
SWB-2(config-if)#no shutdown
SWB-2(config-if)#exit
%LDXX - Interface vlan 1, changed state to up
SWB-2(config)#exit
SWB-2#exit
```

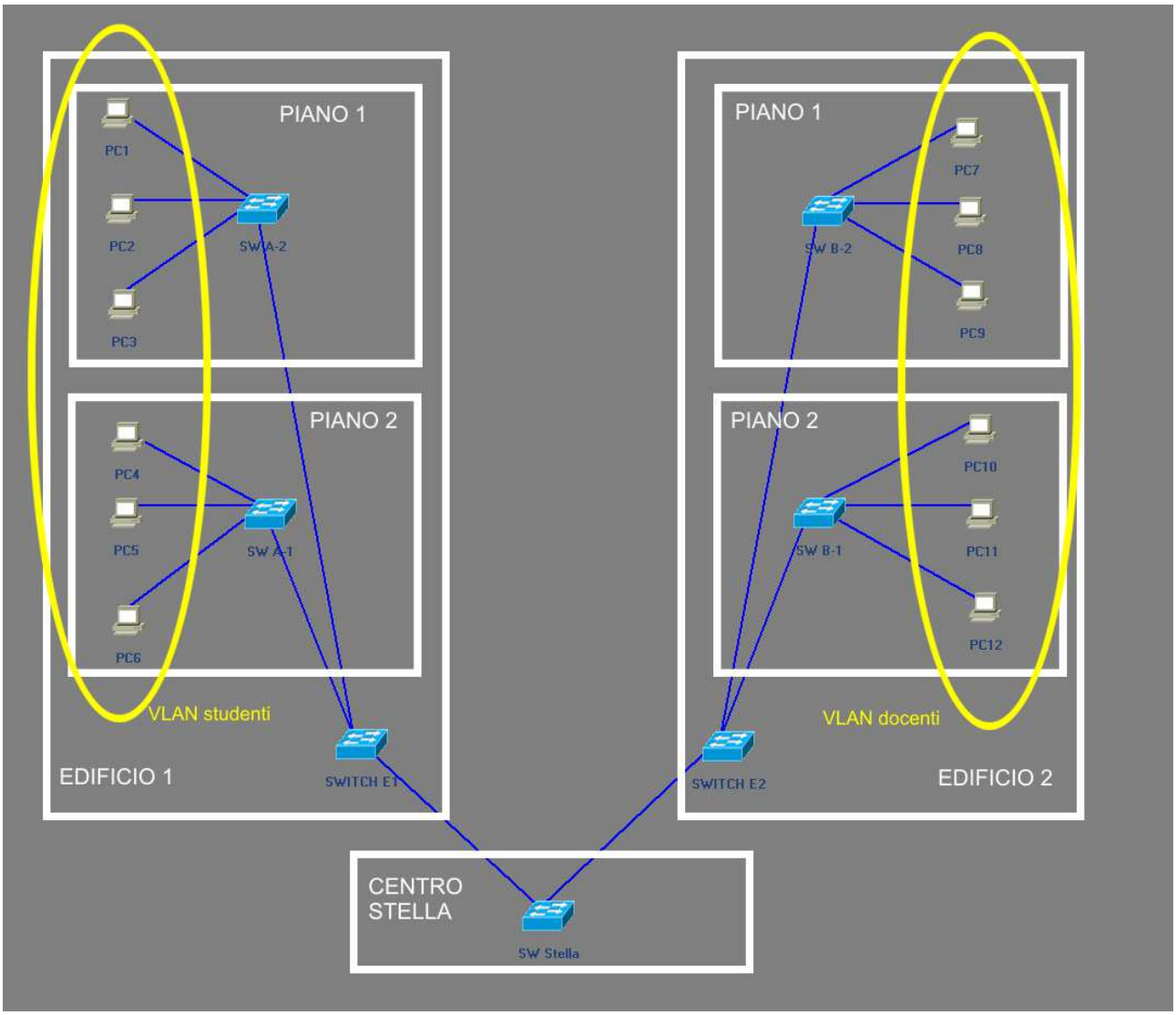
Tramite il comando ping ora testiamo che tutti gli switch siano raggiungibili

```
SWB-2>ping 192.168.1.201

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echoes to 192.168.1.201.
Timeout is 2 seconds:
!!!!!
Success rate is 100% (5/5), round trip min/avg/max = 9/9/11 ms
```

```
SWB-2>ping 192.168.1.202

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echoes to 192.168.1.202.
Timeout is 2 seconds:
.....
Success rate is 100% (5/5), round trip min/avg/max = 9/9/11 ms


SWB-2>ping 192.168.1.203

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echoes to 192.168.1.203.
Timeout is 2 seconds:
!!!!!
Success rate is 100% (5/5), round trip min/avg/max = 10/10/11 ms


SWB-2>ping 192.168.1.204

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echoes to 192.168.1.204.
Timeout is 2 seconds:
!!!!!
Success rate is 100% (5/5), round trip min/avg/max = 10/11/11 ms


SWB-2>ping 192.168.1.205

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echoes to 192.168.1.205.
Timeout is 2 seconds:
!!!!!
Success rate is 100% (5/5), round trip min/avg/max = 8/10/10 ms


SWB-2>ping 192.168.1.206

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echoes to 192.168.1.206.
Timeout is 2 seconds:
!!!!!
Success rate is 100% (5/5), round trip min/avg/max = 9/10/11 ms


SWB-2>ping 192.168.1.207

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echoes to 192.168.1.207.
Timeout is 2 seconds:
!!!!!
Success rate is 100% (5/5), round trip min/avg/max = 8/9/10 ms
```

Ora dividiamo la rete in due VLAN e verifichiamo tramite il comando ping la separazione fra le VLAN.

Ogni VLAN costituisce un dominio di broadcast separato. Usare le VLAN rende più flessibile la gestione di reti diverse collegate allo stesso switch (è possibile assegnare ogni singola porta ad una specifica VLAN) e abbatte i broadcast di una rete, segmentandola in più parti.



VLAN Studenti: 192.168.1.0 255.255.255.0

Pc01: 192.168.1.10 - Pc02: 192.168.1.11 - Pc03: 192.168.1.12
Pc04: 192.168.1.13 - Pc05: 192.168.1.14 - Pc06: 192.168.1.15

VLAN Docenti: 192.168.2.0 255.255.255.0

Pc07: 192.168.2.10 - Pc08: 192.168.2.11 - Pc09: 192.168.2.12
Pc10: 192.168.2.13 - Pc11: 192.168.2.14 - Pc12: 192.168.2.15

Andiamo sullo switch SWA-1 e creiamo la vlan studenti tramite il comando:
vlan

```
SWA-1>enable
SWA-1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
SWA-1(config)#vlan 10
SWA-1(config-vlan)#name studenti
SWA-1(config-vlan)#exit
SWA-1(config)#exit
```

Per vedere le vlan definite sullo switch si usa il comando show vlan in modalità privilegiata

```
SWA-1#show vlan

VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------------------
1    default                           active    Fa0/1, Fa0/2, Fa0/3, Fa0/4
                                                 Fa0/5, Fa0/6, Fa0/7, Fa0/8
                                                 Fa0/9, Fa0/10, Fa0/11, Fa0/12
                                                 Fa0/13, Fa0/14, Fa0/15, Fa0/16
                                                 Fa0/17, Fa0/18, Fa0/19, Fa0/20
                                                 Fa0/21, Fa0/22, Fa0/23, Fa0/24
                                                 Gi0/1, Gi0/2
10   studenti                          active
1002 fddi-default                      act/unsup
1003 token-ring-default                act/unsup
1004 fddinet-default                   act/unsup
1005 trnet-default                     act/unsup
```

Alla porta FastEthernet0/4 sappiamo che è collegato lo Switch di livello superiore e alle porte FastEthernet0/1, FastEthernet0/2, FastEthernet0/3 sono attaccati I PC che andranno messi nella VLAN.

Configuriamo ora le porte dello switch:
Per assegnare una vlan ad una interfaccia si utilizza il comando: switchport access

```
SWA-1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
SWA-1(config)#interface F0/1
SWA-1(config-if)#switchport access vlan 10
SWA-1(config-if)#exit
SWA-1(config)#interface F0/2
```

```
SWA-1(config-if)#switchport access vlan 10
SWA-1(config-if)#exit
SWA-1(config)#interface F0/3
SWA-1(config-if)#switchport access vlan 10
SWA-1(config-if)#exit
SWA-1(config)#
```

E' inoltre possibile configurare una o più porte di uno switch come “trunk port” in cui possono essere convogliate diverse VLAN. Le porte di trunk sono tipicamente utilizzate per collegare fra loro due switch in modo che una o più VLAN possano estendersi sui diversi switch.

Impostiamo quindi la porta che fa da up-link allo switch di livello superiore come **trunk port**

```
SWA-1(config)#interface F0/4
SWA-1(config-if)#switchport mode trunk
SWA-1(config-if)#exit
SWA-1(config)#exit
```

Controlliamo se abbiamo fatto tutto correttamente

```
SWA-1#show vlan

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Fa0/5, Fa0/6, Fa0/7, Fa0/8
                                                Fa0/9, Fa0/10, Fa0/11, Fa0/12
                                                Fa0/13, Fa0/14, Fa0/15, Fa0/16
                                                Fa0/17, Fa0/18, Fa0/19, Fa0/20
                                                Fa0/21, Fa0/22, Fa0/23, Fa0/24
                                                Gi0/1, Gi0/2
10   studenti                         active    Fa0/1, Fa0/2, Fa0/3
1002 fddi-default                     act/unsup
1003 token-ring-default               act/unsup
1004 fddinet-default                  act/unsup
1005 trnet-default                    act/unsup
```

Andiamo poi sullo switch SWA-2 e facciamo la medesima cosa.

Creiamo la vlan studenti

```
SWA-2>enable
SWA-2#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
SWA-2(config)#vlan 10
SWA-2(config-vlan)#name studenti
SWA-2(config-vlan)#exit
SWA-2(config)#exit
```

Configuriamo ora le porte dello switch:
Per assegnare una vlan ad una interfaccia si utilizza il comando: switchport access

```
SWA-2(config)#interface F0/1
SWA-2(config-if)switchport access vlan 10
SWA-2(config-if)#exit
SWA-2(config)#interface F0/2
SWA-2(config-if)#switchport access vlan 10
SWA-2(config-if)#exit
SWA-2(config)#interface F0/3
SWA-2(config-if)#switchport access vlan 10
SWA-2(config-if)#exit
```

Impostiamo quindi la porta che fa da up-link allo switch di livello superiore come trunk port

```
SWA-2(config)#interface F0/4
SWA-2(config-if)#switchport mode trunk
SWA-2(config-if)#exit
```

Ora andiamo sul PC 01 e proviamo a pingare

```
C:>ping 192.168.1.11

Pinging 192.168.1.11 with 32 bytes of data:

Reply from 192.168.1.11 on Eth, time<10ms TTL=128
Reply from 192.168.1.11 on Eth, time<10ms TTL=128
Reply from 192.168.1.11 on Eth, time<10ms TTL=128
Reply from 192.168.1.11 on Eth, time<10ms TTL=128



C:>ping 192.168.1.12

Pinging 192.168.1.12 with 32 bytes of data:

Reply from 192.168.1.12 on Eth, time<10ms TTL=128
Reply from 192.168.1.12 on Eth, time<10ms TTL=128
Reply from 192.168.1.12 on Eth, time<10ms TTL=128
Reply from 192.168.1.12 on Eth, time<10ms TTL=128



C:>ping 192.168.1.13

Pinging 192.168.1.13 with 32 bytes of data:

Ping request timed out.
Ping request timed out.
Ping request timed out.
Ping request timed out.
```

```
C:>ping 192.168.1.14

Pinging 192.168.1.14 with 32 bytes of data:

Ping request timed out.
Ping request timed out.
Ping request timed out.
Ping request timed out.



C:>ping 192.168.1.15

Pinging 192.168.1.15 with 32 bytes of data:

Ping request timed out.
Ping request timed out.
Ping request timed out.
Ping request timed out.
```

Come si può vedere il PC01 riesce a pingare tutti gli host della VLAN studenti sullo switch SW-A2, ma non quelli della stessa VLAN sullo switch SW-A1

Stesso discorso per il PC 04

```
C:>ping 192.168.1.10

Pinging 192.168.1.10 with 32 bytes of data:

Ping request timed out.
Ping request timed out.
Ping request timed out.
Ping request timed out.



C:>ping 192.168.1.11

Pinging 192.168.1.11 with 32 bytes of data:

Ping request timed out.
Ping request timed out.
Ping request timed out.
Ping request timed out.



C:>ping 192.168.1.12

Pinging 192.168.1.12 with 32 bytes of data:

Ping request timed out.
Ping request timed out.
Ping request timed out.
```

```
Ping request timed out.



C:>ping 192.168.1.14

Pinging 192.168.1.14 with 32 bytes of data:

Reply from 192.168.1.14 on Eth, time<10ms TTL=128
Reply from 192.168.1.14 on Eth, time<10ms TTL=128
Reply from 192.168.1.14 on Eth, time<10ms TTL=128
Reply from 192.168.1.14 on Eth, time<10ms TTL=128



C:>ping 192.168.1.15

Pinging 192.168.1.15 with 32 bytes of data:

Reply from 192.168.1.15 on Eth, time<10ms TTL=128
Reply from 192.168.1.15 on Eth, time<10ms TTL=128
Reply from 192.168.1.15 on Eth, time<10ms TTL=128
Reply from 192.168.1.15 on Eth, time<10ms TTL=128
```

Come si può vedere il PC04 riesce a pingare tutti gli host della VLAN studenti sullo switch SW-A1, ma non quelli della stessa VLAN sullo switch SW-A2

Per estendere la VLAN su tutti gli switch dobbiamo configurare lo switch di edificio SWE1 mettendo le porte che raggiungono gli switch di piano in trunk mode

Andiamo quindi sullo switch di edificio SWE1

Sappiamo che alle porte Fastethernet 0/1 e Fastethernet 0/2 sono attaccati gli switch di piano, queste due porte andranno impostate in trunk mode

Inoltre bisogna definire la vlan studenti anche su questo switch

Creiamo la vlan studenti

```
SWE1>enable
SWE1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
SWE1(config)#vlan 10
SWE1(config-vlan)#name studenti
SWE1(config-vlan)#exit
```

Impostiamo quindi le porte che fanno da up-link agli switch di livello inferiore come trunk port

```
SWE1(config-vlan)#name studenti
SWE1(config-vlan)#exit
SWE1(config)#interface F0/1
```

```
SWE1(config-if)#switchport mode trunk
SWE1(config-if)#exit
SWE1(config)#interface F0/2
SWE1(config-if)#switchport mode trunk
SWE1(config-if)#exit
```

Testiamo ora se il PC1 vede i PC 4,5,6

```
C:>ping 192.168.1.13

Pinging 192.168.1.13 with 32 bytes of data:

Reply from 192.168.1.13 on Eth, time<10ms TTL=128
Reply from 192.168.1.13 on Eth, time<10ms TTL=128
Reply from 192.168.1.13 on Eth, time<10ms TTL=128
Reply from 192.168.1.13 on Eth, time<10ms TTL=128



C:>ping 192.168.1.14

Pinging 192.168.1.14 with 32 bytes of data:

Reply from 192.168.1.14 on Eth, time<10ms TTL=128
Reply from 192.168.1.14 on Eth, time<10ms TTL=128
Reply from 192.168.1.14 on Eth, time<10ms TTL=128
Reply from 192.168.1.14 on Eth, time<10ms TTL=128



C:>ping 192.168.1.15

Pinging 192.168.1.15 with 32 bytes of data:

Reply from 192.168.1.15 on Eth, time<10ms TTL=128
Reply from 192.168.1.15 on Eth, time<10ms TTL=128
Reply from 192.168.1.15 on Eth, time<10ms TTL=128
Reply from 192.168.1.15 on Eth, time<10ms TTL=128
```

COME ESERCIZIO ORA CONFIGURATE LA VLAN DELL'EDIFICIO 2

I pc apparterranno alla vlan 20 chiamata Docenti 192.168.2.0 255.255.255.0

Pc07: 192.168.2.10 - Pc08: 192.168.2.11 - Pc09: 192.168.2.12
Pc10: 192.168.2.13 - Pc11: 192.168.2.14 - Pc12: 192.168.2.15

COME ALTRO ESERCIZIO

Configurare Le Vlan In Modo Che:

Vlan Studenti: Pc01, Pc 03, Pc05, Pc07, Pc09, Pc11
Vlan Docenti: Pc02, Pc 04, Pc06, Pc08, Pc10, Pc12

Testare che i Pc della vlan studenti si pingano tra loro e non pingano quella docenti e viceversa.