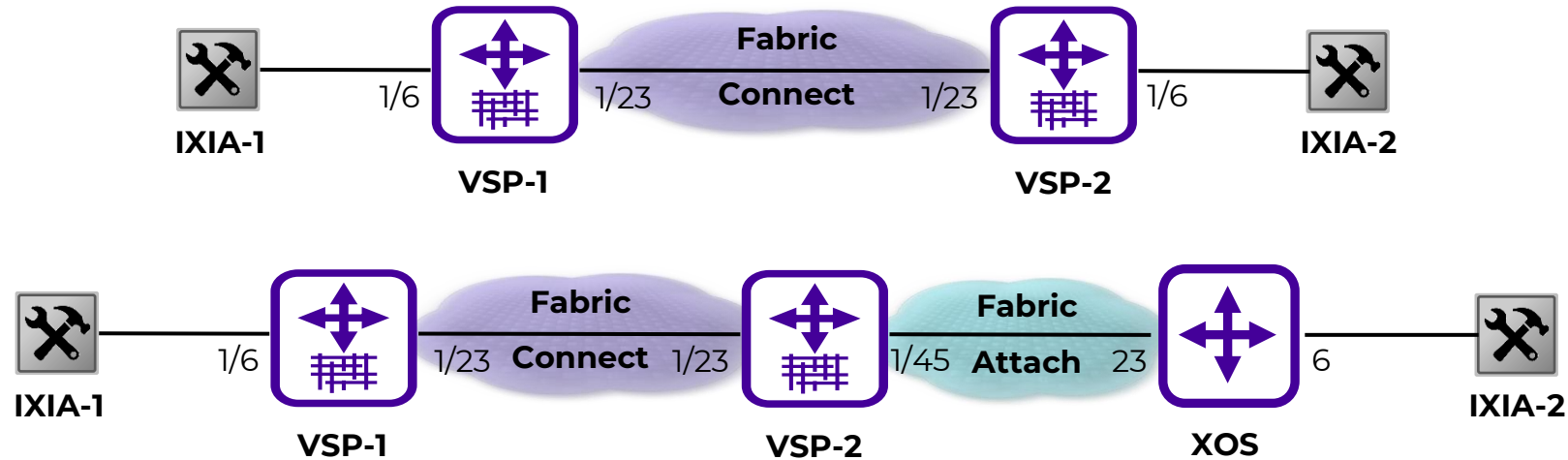




QinQ Transport over Fabric Connect tests Including with XOS VMAN support

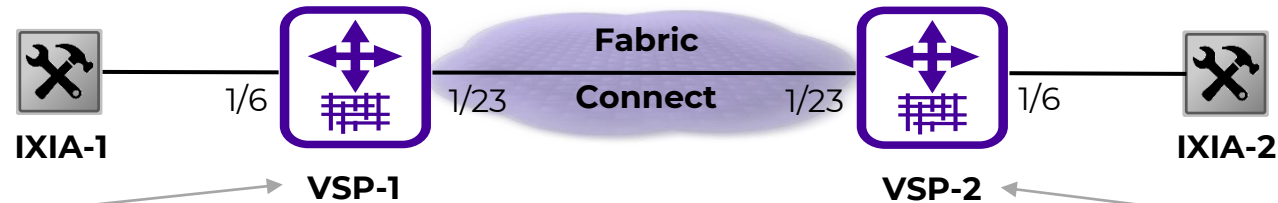
Ludovico Stevens
Technical Marketing Engineering
February 2021



- First setup used to explore transport of QinQ frames over Fabric Connect
- Second setup used to explore integration of Fabric connect with XOS VMAN using Fabric Attach
- x2 VSP-7254XSQ running software 8.3.0.0_B016
 - The results are expected to be the same with earlier software versions
- X460G2 running 31.1.1.3-patch1-1

QinQ transport options over Fabric Connect

Fabric Connect config



```
VSP-1:1(config)#% run spbm
*****
*** This script will guide you through configuring the ***
*** Extreme Networks switch for optimal operation of SPB. ***
*** Extreme Networks switch for optimal operation of SPB. ***
*** -----***
*** The values in [] are the default values, you can ***
*** input alternative values at any of the prompts. ***
*** If you wish to terminate or exit this script ***
*** enter ^C <control-C> at any prompt. ***
*** NOTE: THE COMMAND WILL TEMPORARILY FLAP IS-IS,SPBM ***
*****
SPB Ethertype <0x8100,0x88a8> [0x8100]:
SPBM instance <1-100> [1]:
SPB primary BVLAN <2-4059> [4051]:
SPB secondary BVLAN <2-4059> [4052]:
ISIS system id <xxxx.xxxx.xxxx> [949b.2cae.7c84]:
SPB nickname <x.xx.xx> [e.7c.84]:
SPB Manual Area <xx.xxxx.xxxx...xxxx> [49.0000]:
ISIS System Name [Sbox-VSP7200-2]:
Enable SPBM multicast (y/n) [n]:
Enable IP shortcuts (y/n) [n]:
Configure SPBM SMLT? (y/n) [n]:
ISIS port interfaces <a/b,c/d>[:1/23
ISIS MLT interface <MLT ID LIST> []:
Enable CFM SPBM (y/n) [n]:y
Enter CFM SPBM MEPID <1-8191> [1]:
Enter CFM SPBM level <0-7> [4]:

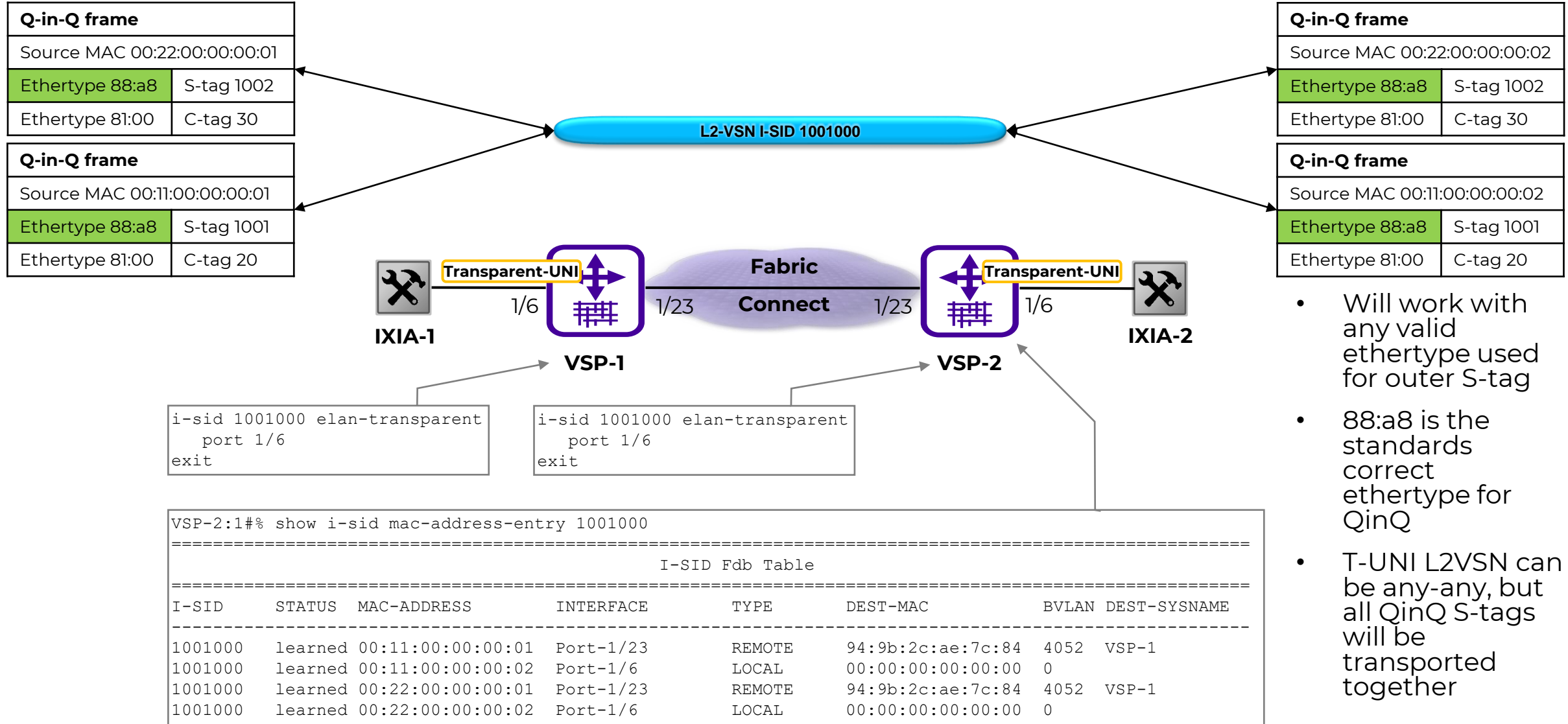
****CONFIGURATION IN PROGRESS****
```

- This config is not necessary with VOSS 8.3 Zero Touch Fabric
- If the interconnects are in autosense, the fabric will self form

```
VSP-2:1(config)#% run spbm
*****
*** This script will guide you through configuring the ***
*** Extreme Networks switch for optimal operation of SPB. ***
*** Extreme Networks switch for optimal operation of SPB. ***
*** -----***
*** The values in [] are the default values, you can ***
*** input alternative values at any of the prompts. ***
*** If you wish to terminate or exit this script ***
*** enter ^C <control-C> at any prompt. ***
*** NOTE: THE COMMAND WILL TEMPORARILY FLAP IS-IS,SPBM ***
*****
SPB Ethertype <0x8100,0x88a8> [0x8100]:
SPBM instance <1-100> [1]:
SPB primary BVLAN <2-4059> [4051]:
SPB secondary BVLAN <2-4059> [4052]:
ISIS system id <xxxx.xxxx.xxxx> [949b.2cae.7c84]:
SPB nickname <x.xx.xx> [e.7c.84]:
SPB Manual Area <xx.xxxx.xxxx...xxxx> [49.0000]:
ISIS System Name [Sbox-VSP7200-2]:
Enable SPBM multicast (y/n) [n]:
Enable IP shortcuts (y/n) [n]:
Configure SPBM SMLT? (y/n) [n]:
ISIS port interfaces <a/b,c/d>[:1/23
ISIS MLT interface <MLT ID LIST> []:
Enable CFM SPBM (y/n) [n]:y
Enter CFM SPBM MEPID <1-8191> [1]:
Enter CFM SPBM level <0-7> [4]:

****CONFIGURATION IN PROGRESS****
```

Q-in-Q transport with Transparent-UNI



- Will work with any valid ethertype used for outer S-tag
- 88:a8 is the standards correct ethertype for QinQ
- T-UNI L2VSN can be any-any, but all QinQ S-tags will be transported together

Q-in-Q transport with Transparent-UNI



```
i-sid 1001000 elan-transparent
port 1/6
exit
```

```
i-sid 1001000 elan-transparent
port 1/6
exit
```

```
VSP-2:1#% show i-sid mac-address-entry 1001000
```

I-SID Fdb Table							
I-SID	STATUS	MAC-ADDRESS	INTERFACE	TYPE	DEST-MAC	BVLAN	DEST-SYSNAME
1001000	learned	00:11:00:00:00:01	Port-1/23	REMOTE	94:9b:2c:ae:7c:84	4052	VSP-1
1001000	learned	00:11:00:00:00:02	Port-1/6	LOCAL	00:00:00:00:00:00	0	
1001000	learned	00:22:00:00:00:01	Port-1/23	REMOTE	94:9b:2c:ae:7c:84	4052	VSP-1
1001000	learned	00:22:00:00:00:02	Port-1/6	LOCAL	00:00:00:00:00:00	0	

- Will work with any valid ethertype used for outer S-tag
- 81:00 can also be used. Some implementations also use 91:00, 92:00, 93:00
- T-UNI L2VSN can be any-any, but all QinQ S-tags will be transported together

Q-in-Q transport with Transparent-UNI



Q-in-Q frame	
Source MAC	00:22:00:00:00:01
Ethertype 88:a8	S-tag 1002
Ethertype 81:00	C-tag 30

Q-in-Q frame	
Source MAC	00:22:00:00:00:02
Ethertype 88:a8	S-tag 1002
Ethertype 81:00	C-tag 30

VLAN Type: Single VLAN Stack VLAN (Q in Q)

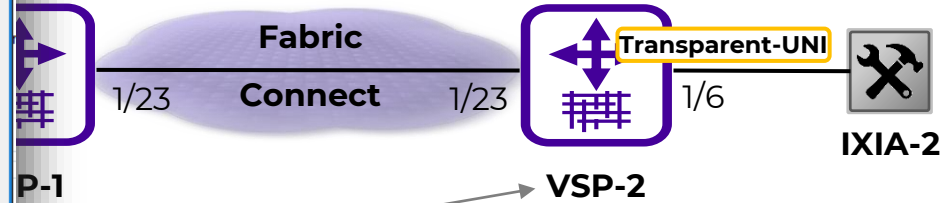
SP-VLAN (Outer)

VLAN ID	Priority	CFI	VLAN ID	Count Mode	Repeat Count	Step	Tag Protocol ID	Tag Control Info
1002	0	Reset	Fixed	10	1	0x88a8	03 EA	

CE-VLAN (Inner)

VLAN ID	Priority	CFI	VLAN ID	Count Mode	Repeat Count	Step	Tag Protocol ID	Tag Control Info
30	0	Reset	Fixed	10	1	0x8100	00 1E	

L2-VSN I-SID 1001000



```
i-sid 1001000 elan-transparent
port 1/6
exit
```

```
i-sid 1001000 elan-transparent
port 1/6
exit
```

```
Ethernet II, Src: 00:22:00:00:00:01 (00:22:00:00:00:01), Dst: 00:22:00:00:00:02 (00:22:00:00:00:02)
  • Destination: 00:22:00:00:00:02 (00:22:00:00:00:02)
  • Source: 00:22:00:00:00:01 (00:22:00:00:00:01)
  • Type: Stack VLAN (802.1 AD defined outer tag) (0x88a8) ←
```

```
802.1Q Virtual LAN
  • 000. .... = Priority: 0
  • ...0 .... = CFI: 0
  • ... 0011 1110 1010 = ID: 1002
  • Type: 802.1Q Virtual LAN (0x8100)
```

```
802.1Q Virtual LAN
  • 000. .... = Priority: 0
  • ...0 .... = CFI: 0
  • ... 0000 0001 1110 = ID: 30
  • Type: IP (0x0800)
```

```
Internet Protocol
```

- QinQ frames with ethertype 88:a8 are carried across
- Any valid QinQ ethertype will work with Transparent-UNI
- It is not possible to translate S-tag VLAN id

Q-in-Q transport with Transparent-UNI



Q-in-Q frame	
Source MAC	00:22:00:00:00:01
Ethertype 81:00	S-tag 1002
Ethertype 81:00	C-tag 30

Q-in-Q frame	
Source MAC	00:22:00:00:00:02
Ethertype 81:00	S-tag 1002
Ethertype 81:00	C-tag 30

VLAN Type: Single VLAN Stack VLAN (Q in Q)

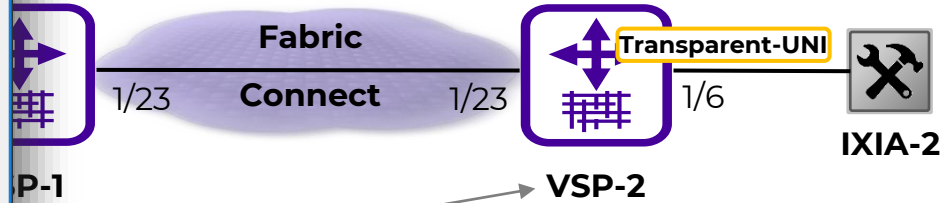
SP-VLAN (Outer)

VLAN ID	User	CFI	VLAN ID Count Mode	Repeat Count	Step	Tag Protocol ID	Tag Control Info
1002	0	Reset	Fixed	10	1	0x8100	03 EA

CE-VLAN (Inner)

VLAN ID	User	CFI	VLAN ID Count Mode	Repeat Count	Step	Tag Protocol ID	Tag Control Info
30	0	Reset	Fixed	10	1	0x8100	00 1E

L2-VSN I-SID 1001000



```
i-sid 1001000 elan-transparent
port 1/6
exit
```

```
i-sid 1001000 elan-transparent
port 1/6
exit
```

Ethernet II, Src: 00:22:00:00:00:01 (00:22:00:00:00:01), Dst: 00:22:00:00:00:02 (00:22:00:00:00:02)

- Destination: 00:22:00:00:00:02 (00:22:00:00:00:02)
- Source: 00:22:00:00:00:01 (00:22:00:00:00:01)
- Type: 802.1Q Virtual LAN (0x8100)

802.1Q Virtual LAN

- 000. = Priority: 0
- ...0 = CFI: 0
- 0011 1110 1010 = ID: 1002
- Type: 802.1Q Virtual LAN (0x8100)

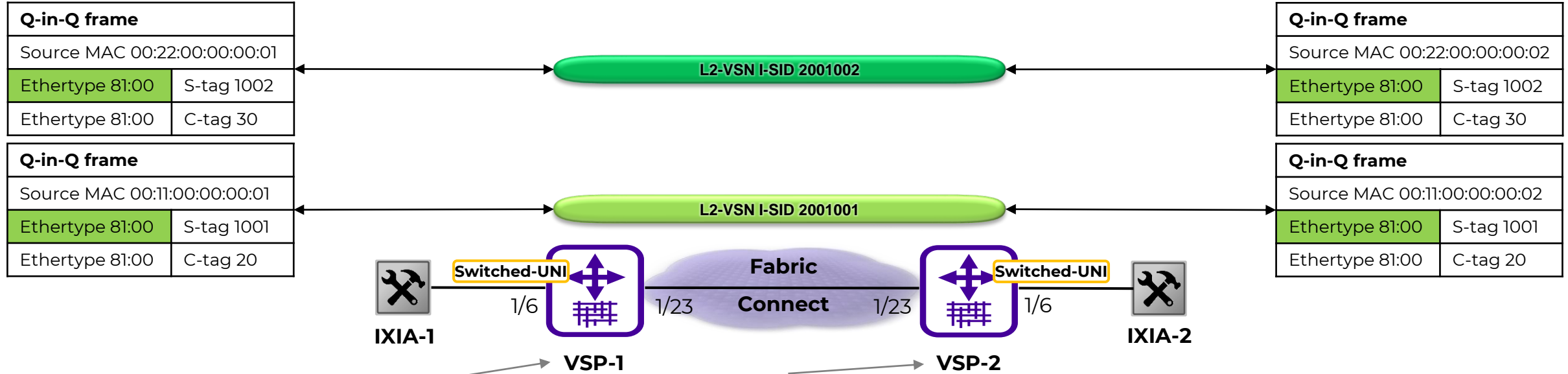
802.1Q Virtual LAN

- 000. = Priority: 0
- ...0 = CFI: 0
- 0000 0001 1110 = ID: 30
- Type: IP (0x0800)

Internet Protocol

- QinQ frames with etherbyte 81:00 are carried across
- Any valid QinQ etherbyte will work with Transparent-UNI
- It is not possible to translate S-tag VLAN id

Q-in-Q transport with Switched-UNI

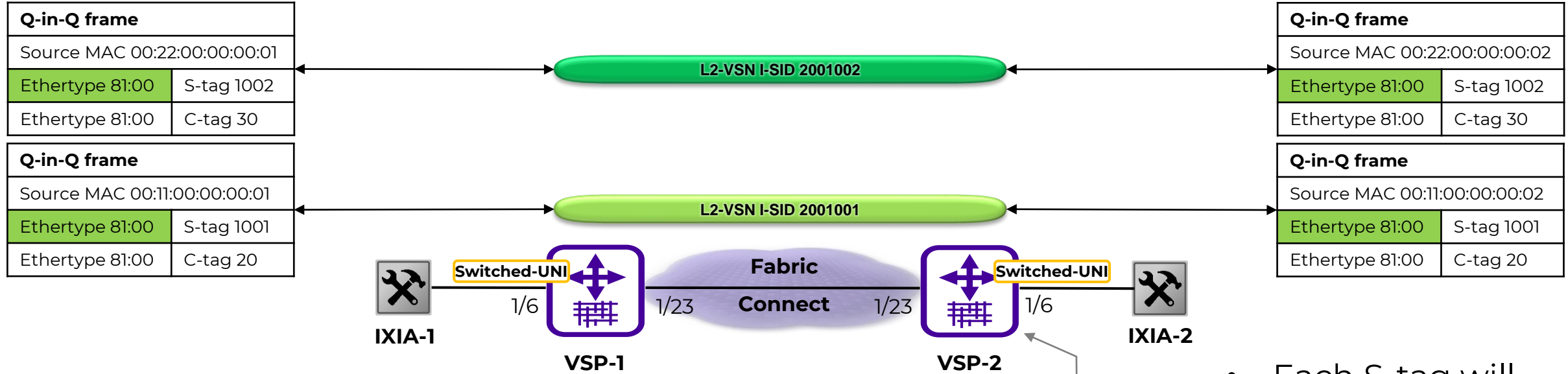


```
interface GigabitEthernet 1/6
  flex-uni enable
exit
i-sid 2001001 elan
  c-vid 1001 port 1/6
exit
i-sid 2001002 elan
  c-vid 1002 port 1/6
exit
```

```
interface GigabitEthernet 1/6
  flex-uni enable
exit
i-sid 2001001 elan
  c-vid 1001 port 1/6
exit
i-sid 2001002 elan
  c-vid 1002 port 1/6
exit
```

- Note, Switched-UNI does not have any native QinQ support
- So, transporting QinQ over Switched-UNI will only work if the S-tag ethertype is 81:00
- I.e. the VSP only sees the QinQ frame as a regular single Q-tag frame

Q-in-Q transport with Switched-UNI



```

VSP-2:1#% show i-sid mac-address-entry 2001001
=====
I-SID Fdb Table
=====
I-SID      STATUS  MAC-ADDRESS      INTERFACE      TYPE      DEST-MAC      BVLAN  DEST-SYSNAME
-----
2001001   learned 00:11:00:00:00:01  Port-1/23     REMOTE     94:9b:2c:ae:7c:84  4051   VSP-1
2001001   learned 00:11:00:00:00:02  c1001:1/6     LOCAL      00:00:00:00:00:00  0

VSP-2:1#% show i-sid mac-address-entry 2001002
=====
I-SID Fdb Table
=====
I-SID      STATUS  MAC-ADDRESS      INTERFACE      TYPE      DEST-MAC      BVLAN  DEST-SYSNAME
-----
2001002   learned 00:22:00:00:00:01  Port-1/23     REMOTE     94:9b:2c:ae:7c:84  4052   VSP-1
2001002   learned 00:22:00:00:00:02  c1002:1/6     LOCAL      00:00:00:00:00:00  0
    
```

- Each S-tag will get assigned an I-SID in Fabric Connect
- It is now possible to transport different S-tags to different Fabric edge nodes (BEBs)

Q-in-Q transport with Switched-UNI



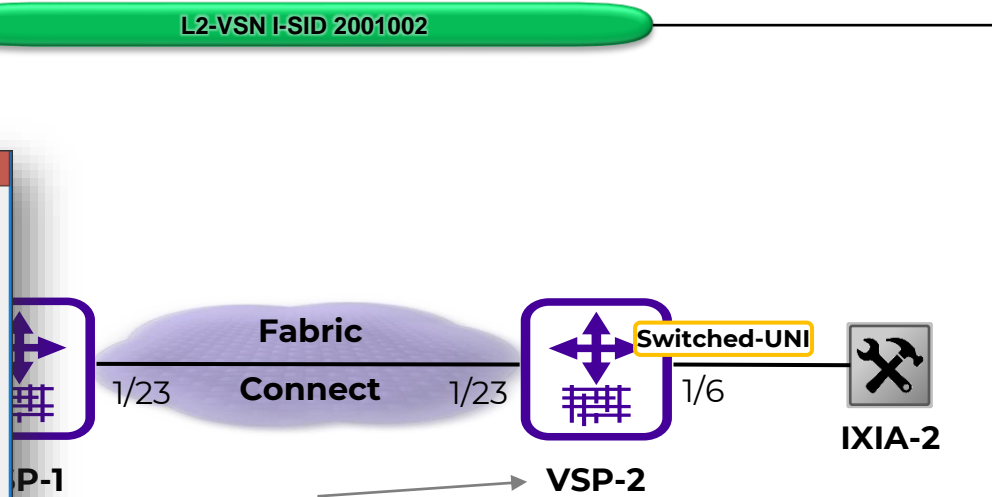
Q-in-Q frame	
Source MAC 00:22:00:00:00:01	
Ethertype 81:00	S-tag 1002
Ethertype 81:00	C-tag 30

Q-in-Q frame	
Source MAC 00:22:00:00:00:02	
Ethertype 81:00	S-tag 1002
Ethertype 81:00	C-tag 30

VLAN(s) configuration window showing Stack VLAN (Q in Q) settings:

SP-VLAN (Outer)	
VLAN ID	1002
Priority	0
CFI	Reset
VLAN ID Count Mode	Fixed
Repeat Count	10
Step	1
Tag Protocol ID	0x8100
Tag Control Info	03 EA

CE-VLAN (Inner)	
VLAN ID	30
Priority	0
CFI	Reset
VLAN ID Count Mode	Fixed
Repeat Count	10
Step	1
Tag Protocol ID	0x8100
Tag Control Info	00 1E



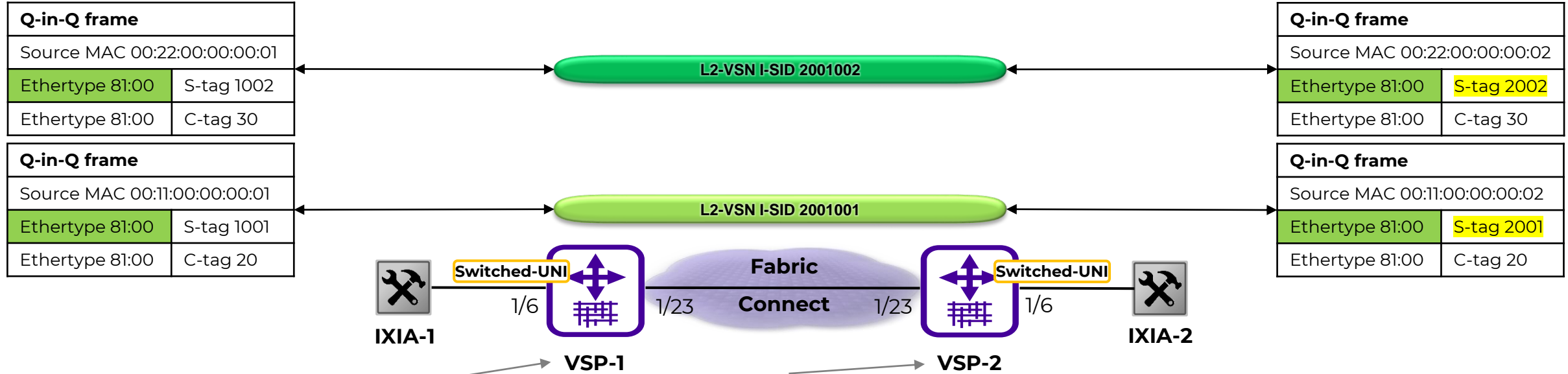
```
interface GigabitEthernet 1/6
 flex-uni enable
exit
i-sid 2001001 elan
 c-vid 1001 port 1/6
exit
i-sid 2001002 elan
 c-vid 1002 port 1/6
exit
```

```
interface GigabitEthernet 1/6
 flex-uni enable
exit
i-sid 2001001 elan
 c-vid 1001 port 1/6
exit
i-sid 2001002 elan
 c-vid 1002 port 1/6
exit
```

Network configuration details for VSP-2:

- Ethernet II, Src: 00:22:00:00:00:01 (00:22:00:00:00:01), Dst: 00:22:00:00:00:02 (00:22:00:00:00:02)
 - Destination: 00:22:00:00:00:02 (00:22:00:00:00:02)
 - Source: 00:22:00:00:00:01 (00:22:00:00:00:01)
 - Type: 802.1Q Virtual LAN (0x8100) ←
- 802.1Q Virtual LAN
 - 000. = Priority: 0
 - ...0 = CFI: 0
 - 0011 1110 1010 = ID: 1002
 - Type: 802.1Q Virtual LAN (0x8100)
- 802.1Q Virtual LAN
 - 000. = Priority: 0
 - ...0 = CFI: 0
 - 0000 0001 1110 = ID: 30
 - Type: IP (0x0800)
- Internet Protocol

Q-in-Q transport with Switched-UNI – translating S-tag



```
interface GigabitEthernet 1/6
  flex-uni enable
exit
i-sid 2001001 elan
  c-vid 1001 port 1/6
exit
i-sid 2001002 elan
  c-vid 1002 port 1/6
exit
```

```
interface GigabitEthernet 1/6
  flex-uni enable
exit
i-sid 2001001 elan
  c-vid 2001 port 1/6
exit
i-sid 2001002 elan
  c-vid 2002 port 1/6
exit
```

- Translating S-tag VLAN id is possible with Switched-UNI
- Even across different UNI ports of same VSP node

Q-in-Q transport with Switched-UNI – translating S-tag



Q-in-Q frame	
Source MAC 00:22:00:00:00:01	
Ethertype 81:00	S-tag 1002
Ethertype 81:00	C-tag 30

Q-in-Q frame	
Source MAC 00:22:00:00:00:02	
Ethertype 81:00	S-tag 2002
Ethertype 81:00	C-tag 30

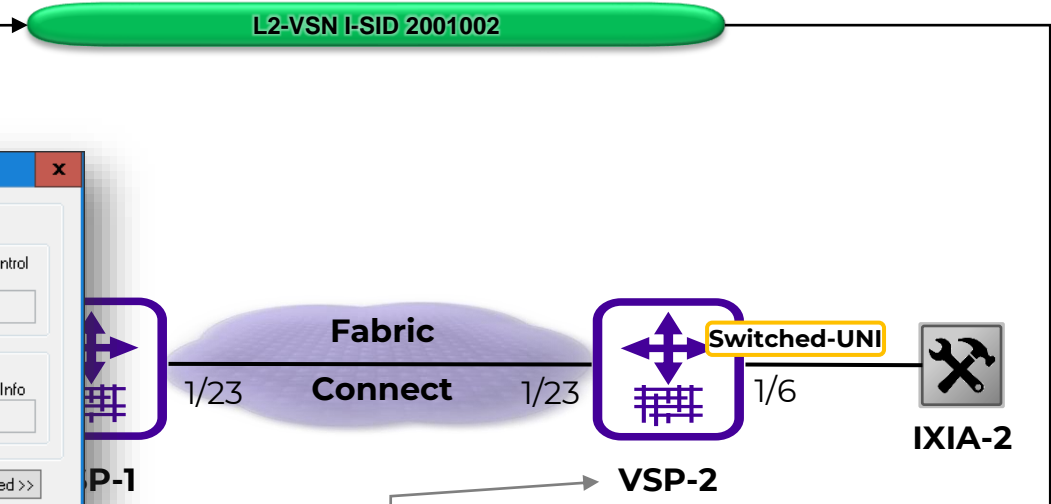
VLAN Type: Single VLAN Stack VLAN (Q in Q)

SP-VLAN (Outer)

VLAN ID	User	Priority	CFI	VLAN ID	Count Mode	Repeat Count	Step	Tag Protocol ID	Tag Control Info
1002		0	Reset	Fixed	10	1		0x8100	03 EA

CE-VLAN (Inner)

VLAN ID	User	Priority	CFI	VLAN ID	Count Mode	Repeat Count	Step	Tag Protocol ID	Tag Control Info
30		0	Reset	Fixed	10	1		0x8100	00 1E



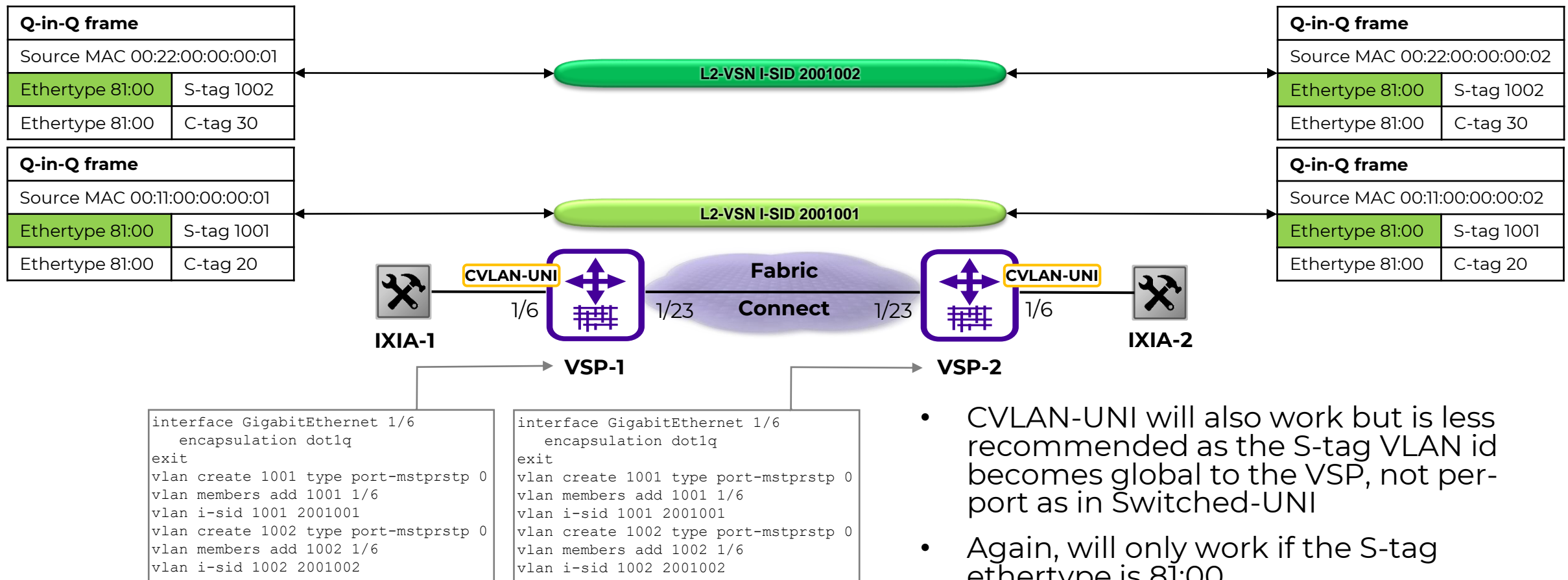
```
interface GigabitEthernet 1/6
  flex-uni enable
exit
i-sid 2001001 elan
  c-vid 1001 port 1/6
exit
i-sid 2001002 elan
  c-vid 1002 port 1/6
exit
```

```
interface GigabitEthernet 1/6
  flex-uni enable
exit
i-sid 2001001 elan
  c-vid 2001 port 1/6
exit
i-sid 2001002 elan
  c-vid 2002 port 1/6
exit
```

```
Ethernet II, Src: 00:22:00:00:00:01 (00:22:00:00:00:01), Dst: 00:22:00:00:00:02 (00:22:00:00:00:02)
  • Destination: 00:22:00:00:00:02 (00:22:00:00:00:02)
  • Source: 00:22:00:00:00:01 (00:22:00:00:00:01)
  • Type: 802.1Q Virtual LAN (0x8100)
802.1Q Virtual LAN
  • 000. .... = Priority: 0
  • ...0 .... = CFI: 0
  • .... 0111 1101 0010 = ID: 2002
  • Type: 802.1Q Virtual LAN (0x8100)
802.1Q Virtual LAN
  • 000. .... = Priority: 0
  • ...0 .... = CFI: 0
  • .... 0000 0001 1110 = ID: 30
  • Type: IP (0x0800)
Internet Protocol
```

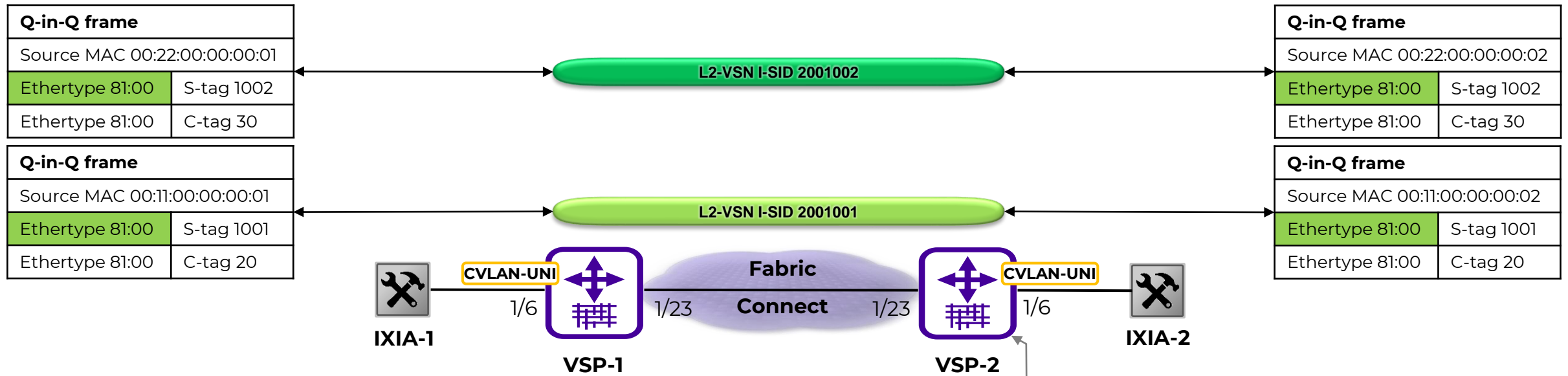
- Note that the correct S-tag is updated on egress of the Switched-UNI port

Q-in-Q transport with CVLAN-UNI



- CVLAN-UNI will also work but is less recommended as the S-tag VLAN id becomes global to the VSP, not per-port as in Switched-UNI
- Again, will only work if the S-tag ethertype is 81:00
- CVLAN-UNI can run Spanning tree on access ports; not Switched-UNI

Q-in-Q transport with CVLAN-UNI



```
VSP-2:1#% show vlan mac-address-entry 1001
-----
Vlan Fdb
-----
VLAN
ID  STATUS  MAC ADDRESS          INTERFACE          SMLT
REMOTE  TUNNEL
-----
1001 learned  00:11:00:00:00:01  Port-1/23         false
VSP-1
1001 learned  00:11:00:00:00:02  Port-1/6          false
-

VSP-2:1#% show vlan mac-address-entry 1002
-----
Vlan Fdb
-----
VLAN
ID  STATUS  MAC ADDRESS          INTERFACE          SMLT
REMOTE  TUNNEL
-----
1002 learned  00:22:00:00:00:01  Port-1/23         false
VSP-1
1002 learned  00:22:00:00:00:02  Port-1/6          false
-
```

Q-in-Q transport with CVLAN-UNI



Q-in-Q frame	
Source MAC 00:22:00:00:00:01	
Ethertype 81:00	S-tag 1002
Ethertype 81:00	C-tag 30

Q-in-Q frame	
Source MAC 00:22:00:00:00:02	
Ethertype 81:00	S-tag 1002
Ethertype 81:00	C-tag 30

VLAN(s)

VLAN Type: Single VLAN Stack VLAN (Q in Q)

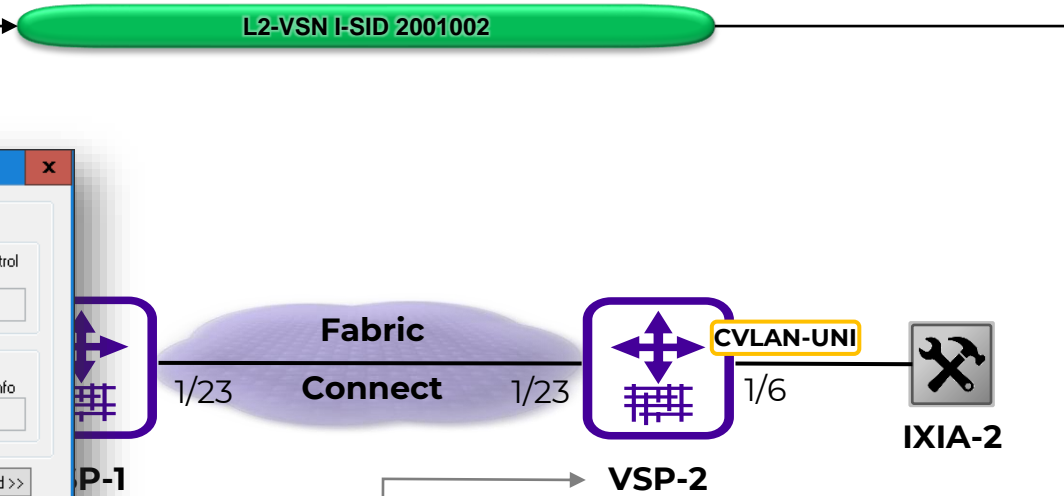
SP-VLAN (Outer)

VLAN ID	User	CFI	VLAN ID	Count Mode	Repeat Count	Step	Tag Protocol ID	Tag Control Info
1002	0	Reset	Fixed	10	1	0x8100	03 EA	

CE-VLAN (Inner)

VLAN ID	User	CFI	VLAN ID	Count Mode	Repeat Count	Step	Tag Protocol ID	Tag Control Info
30	0	Reset	Fixed	10	1	0x8100	00 1E	

OK Cancel Advanced >>



```
interface GigabitEthernet 1/6
 encapsulation dot1q
 exit
 vlan create 1001 type port-mstprstp 0
 vlan members add 1001 1/6
 vlan i-sid 1001 2001001
 vlan create 1002 type port-mstprstp 0
 vlan members add 1002 1/6
 vlan i-sid 1002 2001002
```

```
interface GigabitEthernet 1/6
 encapsulation dot1q
 exit
 vlan create 1001 type port-mstprstp 0
 vlan members add 1001 1/6
 vlan i-sid 1001 2001001
 vlan create 1002 type port-mstprstp 0
 vlan members add 1002 1/6
 vlan i-sid 1002 2001002
```

Ethernet II, Src: 00:22:00:00:00:01 (00:22:00:00:00:01), Dst: 00:22:00:00:00:02 (00:22:00:00:00:02)

- Destination: 00:22:00:00:00:02 (00:22:00:00:00:02)
- Source: 00:22:00:00:00:01 (00:22:00:00:00:01)
- Type: 802.1Q Virtual LAN (0x8100) ←

802.1Q Virtual LAN

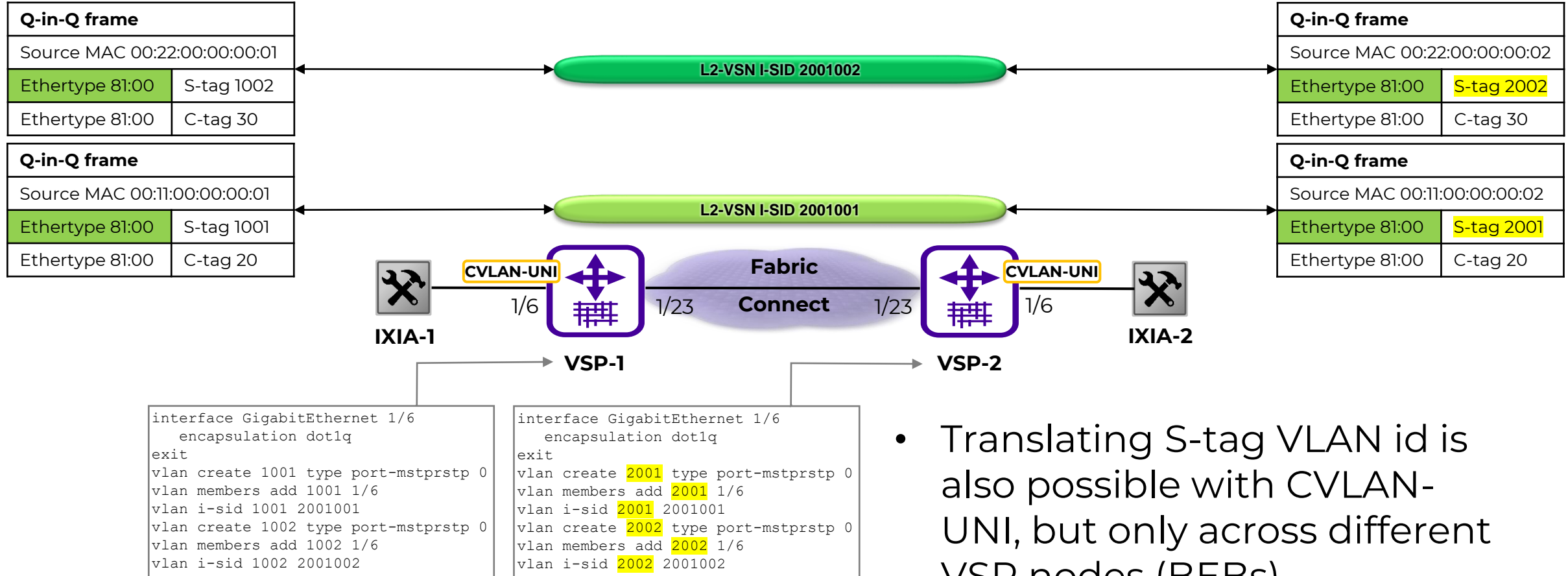
- 000. = Priority: 0
- ...0 = CFI: 0
- 0011 1110 1010 = ID: 1002
- Type: 802.1Q Virtual LAN (0x8100)

802.1Q Virtual LAN

- 000. = Priority: 0
- ...0 = CFI: 0
- 0000 0001 1110 = ID: 30
- Type: IP (0x0800)

Internet Protocol

Q-in-Q transport with CVLAN-UNI – translating S-tag



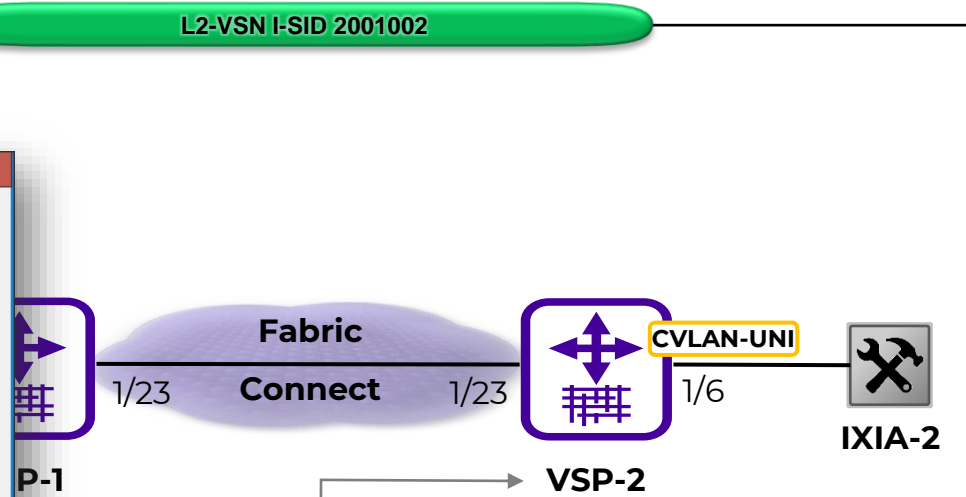
- Translating S-tag VLAN id is also possible with CVLAN-UNI, but only across different VSP nodes (BEBs)
 - Not across different ports of same VSP

Q-in-Q transport with CVLAN-UNI – translating S-tag



Q-in-Q frame	
Source MAC 00:22:00:00:00:01	
Ethertype 81:00	S-tag 1002
Ethertype 81:00	C-tag 30

Q-in-Q frame	
Source MAC 00:22:00:00:00:02	
Ethertype 81:00	S-tag 2002
Ethertype 81:00	C-tag 30

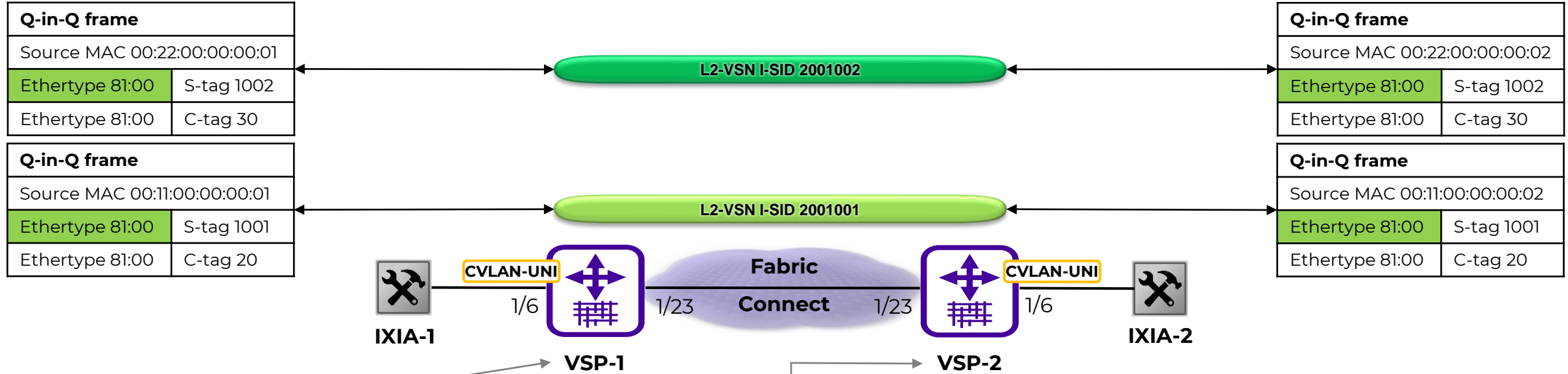


```
interface GigabitEthernet 1/6
 encapsulation dot1q
 exit
 vlan create 1001 type port-mstprstp 0
 vlan members add 1001 1/6
 vlan i-sid 1001 2001001
 vlan create 1002 type port-mstprstp 0
 vlan members add 1002 1/6
 vlan i-sid 1002 2001002
```

```
interface GigabitEthernet 1/6
 encapsulation dot1q
 exit
 vlan create 2001 type port-mstprstp 0
 vlan members add 1001 1/6
 vlan i-sid 2001 2001001
 vlan create 2002 type port-mstprstp 0
 vlan members add 1002 1/6
 vlan i-sid 2002 2001002
```

- Note that the correct S-tag is updated on egress of the CVLAN-UNI port

Q-in-Q transport with Switched-UNI & CVLAN-UNI



```
interface GigabitEthernet 1/6
  flex-uni enable
exit
i-sid 2001001 elan
  c-vid 1001 port 1/6
exit
i-sid 2001002 elan
  c-vid 1002 port 1/6
exit
```

```
interface GigabitEthernet 1/6
  encapsulation dot1q
exit
vlan create 1001 type port-mstprstp 0
vlan members add 1001 1/6
vlan i-sid 1001 2001001
vlan create 1002 type port-mstprstp 0
vlan members add 1002 1/6
vlan i-sid 1002 2001002
```

- Switched-UNI and CVLAN-UNI can be mixed in same L2VSN service
- Not so for Transparent-UNI, which requires all endpoint UNIs to be of type Transparent-UNI

Fabric Connect combinations which will fail with QinQ
TO BE AVOIDED !

Using 88:a8 ethertype with Switched-UNI or CVLAN-UNI



Q-in-Q frame	
Source MAC 00:22:00:00:00:01	
Ethertype 88:a8	S-tag 1002
Ethertype 81:00	C-tag 30

VLAN(s)

VLAN Type

Single VLAN Stack VLAN (Q in Q)

SP-VLAN (Outer)

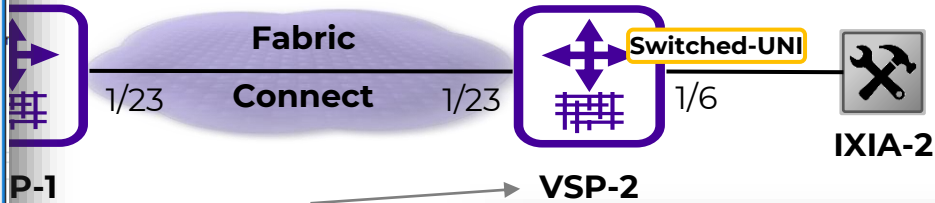
VLAN ID	Priority	CFI	VLAN ID Count Mode	Repeat Count	Step	Tag Protocol ID	Tag Control Info
1002	0	Reset	Fixed	10	1	0x88a8	03 EA

CE-VLAN (Inner)

VLAN ID	Priority	CFI	VLAN ID Count Mode	Repeat Count	Step	Tag Protocol ID	Tag Control Info
30	0	Reset	Fixed	10	1	0x8100	00 1E

OK Cancel Advanced >>

L2-VSN I-SID 2001002



```
interface GigabitEthernet 1/6
 flex-uni enable
exit
i-sid 2001001 elan
 c-vid 1001 port 1/6
exit
i-sid 2001002 elan
 c-vid 1002 port 1/6
exit
```

```
interface GigabitEthernet 1/6
 flex-uni enable
exit
i-sid 2001001 elan
 c-vid 1001 port 1/6
exit
i-sid 2001002 elan
 c-vid 1002 port 1/6
exit
```

Ethernet II, Src: 00:22:00:00:00:01 (00:22:00:00:00:01), Dst: 00:22:00:00:00:02 (00:22:00:00:00:02)

- Destination: 00:22:00:00:00:02 (00:22:00:00:00:02)
- Source: 00:22:00:00:00:01 (00:22:00:00:00:01)
- Type: 802.1Q Virtual LAN (0x8100)

802.1Q Virtual LAN

- 000. = Priority: 0
- ...0 = CFI: 0
- 0011 1110 1010 = ID: 1002
- Type: Stack VLAN (802.1 AD defined outer tag) (0x88a8)

802.1Q Virtual LAN

- 000. = Priority: 0
- ...0 = CFI: 0
- 0011 1110 1010 = ID: 1002
- Type: 802.1Q Virtual LAN (0x8100)

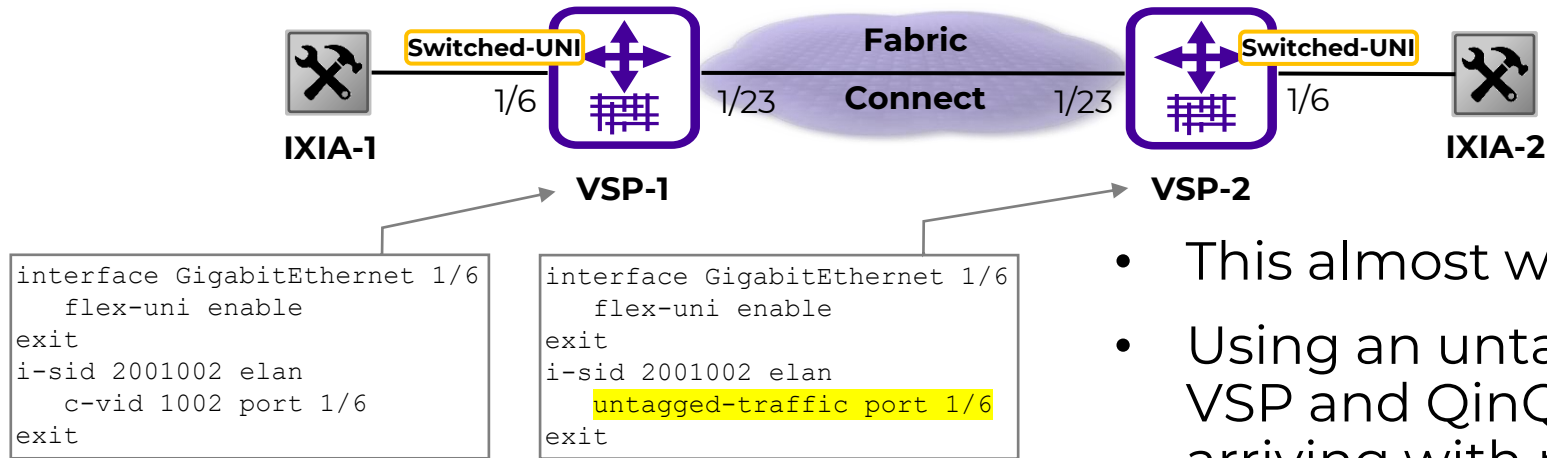
802.1Q Virtual LAN

- 000. = Priority: 0
- ...0 = CFI: 0
- 0000 0001 1110 = ID: 30
- Type: IP (0x0800)

Internet Protocol

- The frame is accepted on ingress, but on egress the frame gets a 3rd Q-tag inserted which is not going to work
- The same happens with CVLAN-UNI

Popping/Pushing QinQ S-tag over L2VSN



- This almost works...
- Using an untagged binding on the VSP and QinQ C-tag frames arriving with neither the 81:00 nor the 88:a8 ethertypes, so that the VSP UNI port will treat them as untagged
 - Will also work with CVLAN-UNI

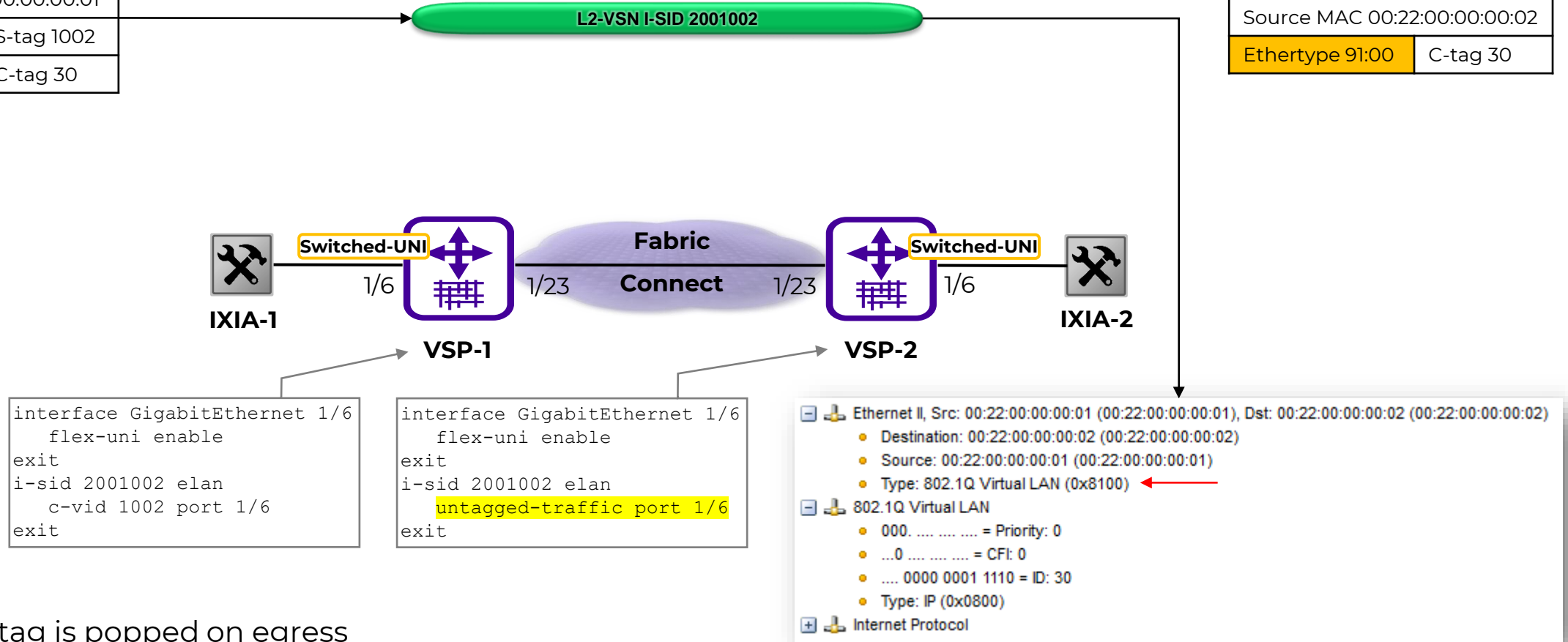
- Do not use this approach
- Instead combine Fabric Connect with XOS VMAN as shown in next section

Popping QinQ S-tag over L2VSN



Q-in-Q frame	
Source MAC 00:22:00:00:00:01	
Ethertype 81:00	S-tag 1002
Ethertype 81:00	C-tag 30

Regular Q-tagged frame	
Source MAC 00:22:00:00:00:02	
Ethertype 91:00	C-tag 30



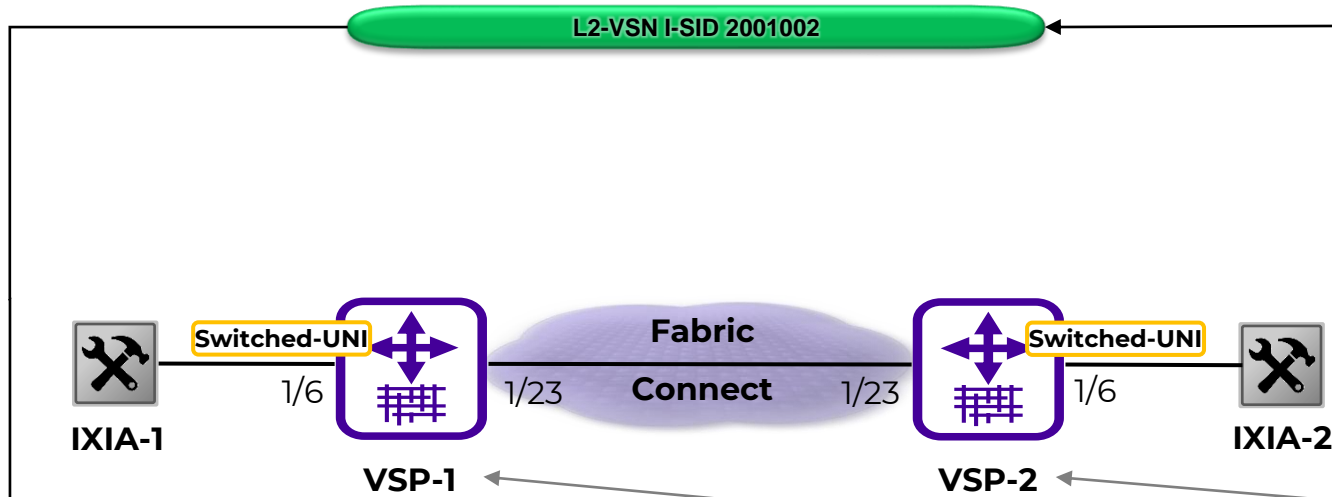
- The S-tag is popped on egress
- But note that C-tag frames will egress with ethertype 81:00, but will have to ingress with a different ethertype...

Pushing QinQ S-tag over L2VSN



Q-in-Q frame	
Source MAC 00:22:00:00:00:01	
Ethertype 81:00	S-tag 1002
Ethertype 81:00	C-tag 30

Regular Q-tagged frame	
Source MAC 00:22:00:00:00:02	
Ethertype 91:00	C-tag 30



Ethernet II, Src: 00:22:00:00:00:02 (00:22:00:00:00:02), Dst: 00:22:00:00:00:01 (00:22:00:00:00:01)

- Destination: 00:22:00:00:00:01 (00:22:00:00:00:01)
- Source: 00:22:00:00:00:02 (00:22:00:00:00:02)
- Type: 802.1Q Virtual LAN (0x8100) ←

802.1Q Virtual LAN

- 000. = Priority: 0
- ...0 = CFI: 0
- ... 0011 1110 1010 = ID: 1002
- Type: (Cisco) Stack VLAN (0x9100) ←

802.1Q Virtual LAN

- 000. = Priority: 0
- ...0 = CFI: 0
- ... 0000 0001 1110 = ID: 30
- Type: IP (0x0800)

Internet Protocol

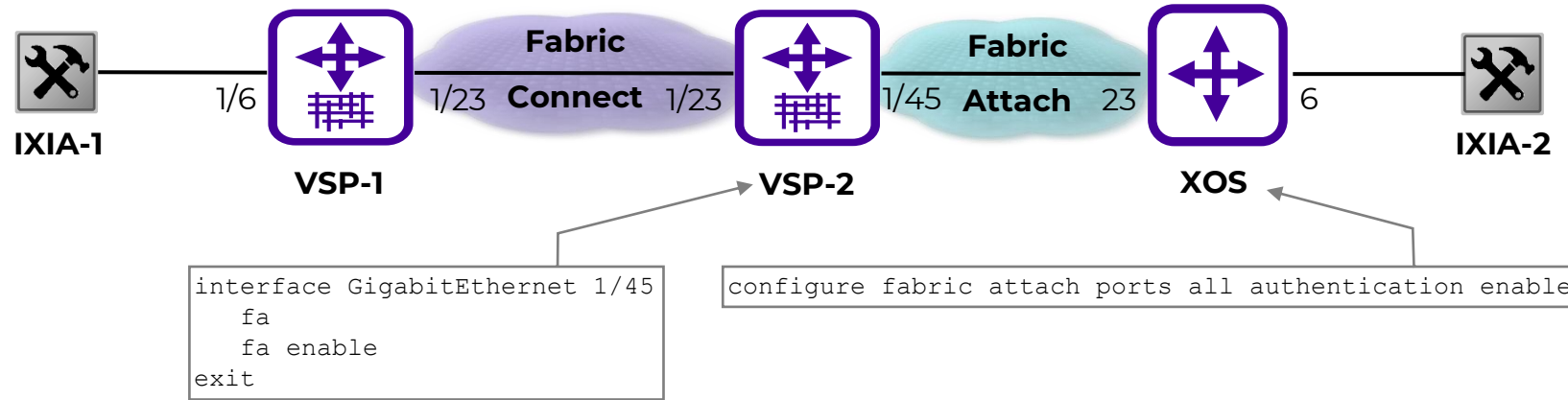
```
interface GigabitEthernet 1/6
  flex-uni enable
exit
i-sid 2001002 elan
  c-vid 1002 port 1/6
exit
```

```
interface GigabitEthernet 1/6
  flex-uni enable
exit
i-sid 2001002 elan
  untagged-traffic port 1/6
exit
```

- S-tag is correctly pushed on egress and etherstype will be consistent on this side
- But the C-tag will go out with etherstype 91:00 which is not going to work..

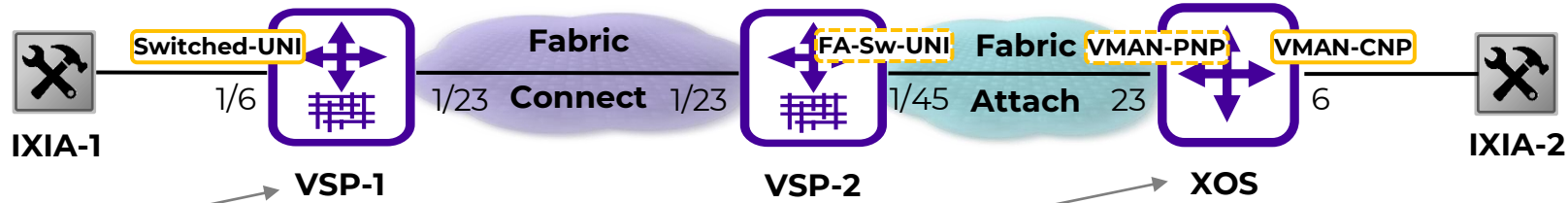
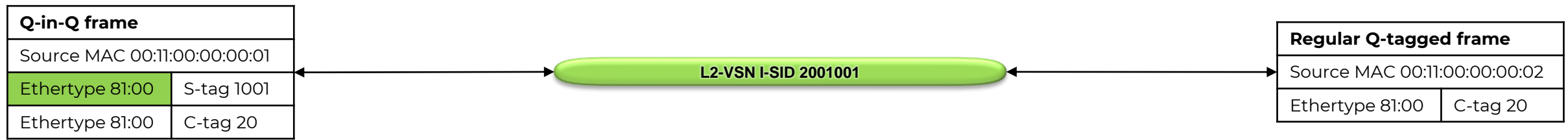
Integration of Fabric Connect with XOS VMAN using Fabric Attach, for QinQ end-end

Fabric Attach delta config



- Fabric Connect configuration is same as in previous section
 - Fully automated and nothing to configure if VSPs running 8.3 with Zero Touch Fabric
- Additional config to enable Fabric Attach on link between VSP-2 and XOS
 - Even this config is fully automated and not needed if VSPs running 8.3 with Zero Touch Fabric

Q-in-Q with Fabric Connect + Fabric Attach + XOS VMAN



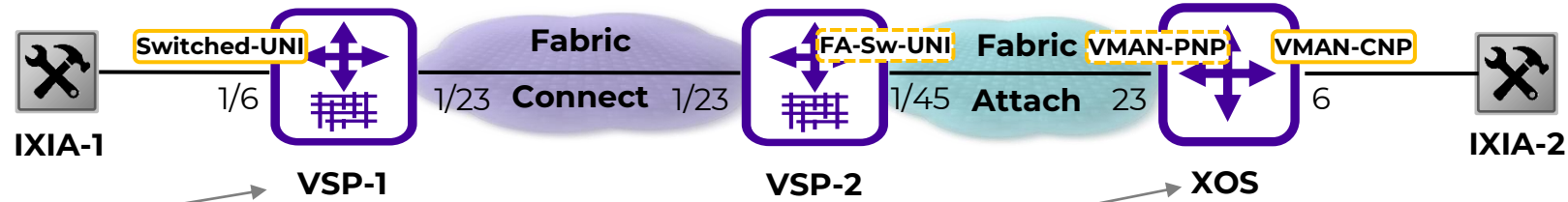
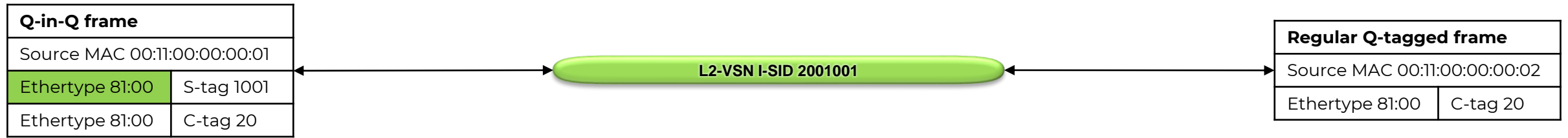
```
interface GigabitEthernet 1/6
  flex-uni enable
exit
i-sid 2001001 elan
  c-vid 1001 port 1/6
exit
i-sid name 2001001 Cust1
```

```
configure vman etherbyte 0x8100 primary
configure vlan 1 delete ports all
create vman cust1 tag 1001
configure vlan 1001 add isid 2001001
configure vman cust1 add ports 6 untagged
```

- Switched-UNI is used on VSP-1 and Switched-UNI is always used by FA ports
- Again, QinQ can only be transported over Switched-UNI if the S-tag etherbyte is set to 81:00
- XOS VMAN is configured with etherbyte 81:00 as primary (and no secondary)
- The VMAN S-tag VLAN id can be associated with an I-SID, so that the XOS can create the binding via FA signalling

- In this example XOS VMAN is configured with a CNP access, but could also have been configured as CEP access

Q-in-Q with Fabric Connect + Fabric Attach + XOS VMAN

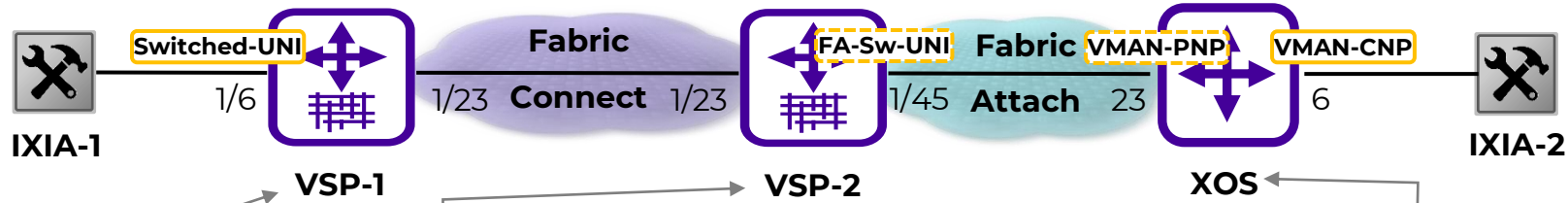
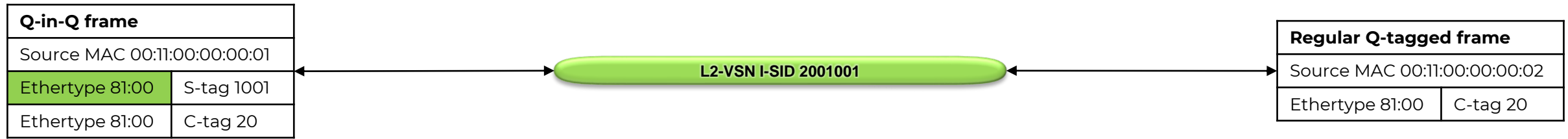


```
XOS.28 # show fabric attach assignments
Fabric Attach Mode: Proxy
Port      VLAN  VLAN Name      Type      ISID/NSI  Status
-----  -
1001     cust1          Static    2001001   Active
```

```
VSP-2:1# show fa assignment
=====
Fabric Attach Assignment Map
=====
Interface  I-SID  Vlan  State  Origin  I-SID Name
-----  -
1/45      2001001  1001  active  proxy   ISID-2001001
```

- Thanks to Fabric Attach, VMAN can provide simple end-point provisioning over a Fabric Connect core without any config required over the VSP Core nodes

Q-in-Q with Fabric Connect + Fabric Attach + XOS VMAN

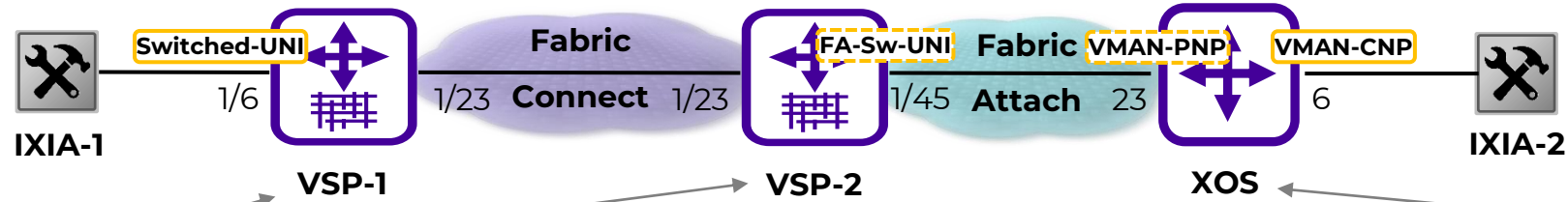
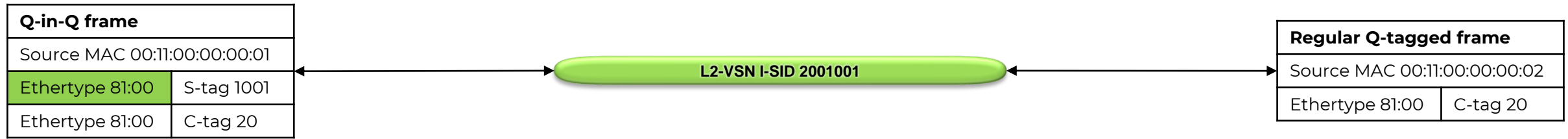


```
XOS.29 # show port 6,23 vlan description port-number
      Untagged
Port  /Tagged  VLAN Name          VID VLAN Description
-----
6     Untagged  cust1                   1001
23    Untagged  None
      Tagged   cust1                   1001
```

```
VSP-2:1# show interface gigabitEthernet i-sid 1/45
=====
PORT Isid Info
=====
PORTNUM IFINDEX  ISID      VLANID C-VID  ISID      ISID      BPDU  MAC
          ID      VLANID C-VID  TYPE    ORIGIN   NAME
-----
1/45     236     2001001  N/A    1001   ELAN     - D1-  -   -   -   ISID-2001001  FALSE
```

```
VSP-1:1# show interface gigabitEthernet i-sid 1/6
=====
PORT Isid Info
=====
PORTNUM IFINDEX  ISID      VLANID C-VID  ISID      ISID      BPDU  MAC
          ID      VLANID C-VID  TYPE    ORIGIN   NAME
-----
1/6     197     2001001  N/A    1001   ELAN     C ---  -   -   -   Cust1          FALSE
```

Q-in-Q with Fabric Connect + Fabric Attach + XOS VMAN



```
XOS.31 # show fdb vlan cust1
MAC                               VLAN Name ( Tag)  Age  Flags          Port / Virtual Port List
-----
00:11:00:00:00:01                  cust1(1001)      0000 dhm             23
00:11:00:00:00:02                  cust1(1001)      0000 dhm             6
```

```
VSP-2:1# show i-sid mac-address-entry 2001001
=====
I-SID Fdb Table
=====
I-SID   STATUS  MAC-ADDRESS      INTERFACE      TYPE      DEST-MAC          BVLAN  DEST-SYSNAME
-----
2001001 learned 00:11:00:00:00:01 Port-1/23      REMOTE     94:9b:2c:ae:7c:84 4051  VSP-1
2001001 learned 00:11:00:00:00:02 c1001:1/45     LOCAL      00:00:00:00:00:00 0
```

```
VSP-1:1# show i-sid mac-address-entry 2001001
=====
I-SID Fdb Table
=====
I-SID   STATUS  MAC-ADDRESS      INTERFACE      TYPE      DEST-MAC          BVLAN  DEST-SYSNAME
-----
2001001 learned 00:11:00:00:00:01 c1001:1/6     LOCAL      00:00:00:00:00:00 0
2001001 learned 00:11:00:00:00:02 Port-1/23     REMOTE     94:9b:2c:ad:48:84 4051  VSP-2
```

Q-in-Q with Fabric Connect + Fabric Attach + XOS VMAN



Q-in-Q frame	
Source MAC 00:11:00:00:00:01	
Ethertype 81:00	S-tag 1001
Ethertype 81:00	C-tag 20

Regular Q-tagged frame	
Source MAC 00:11:00:00:00:02	
Ethertype 81:00	C-tag 20

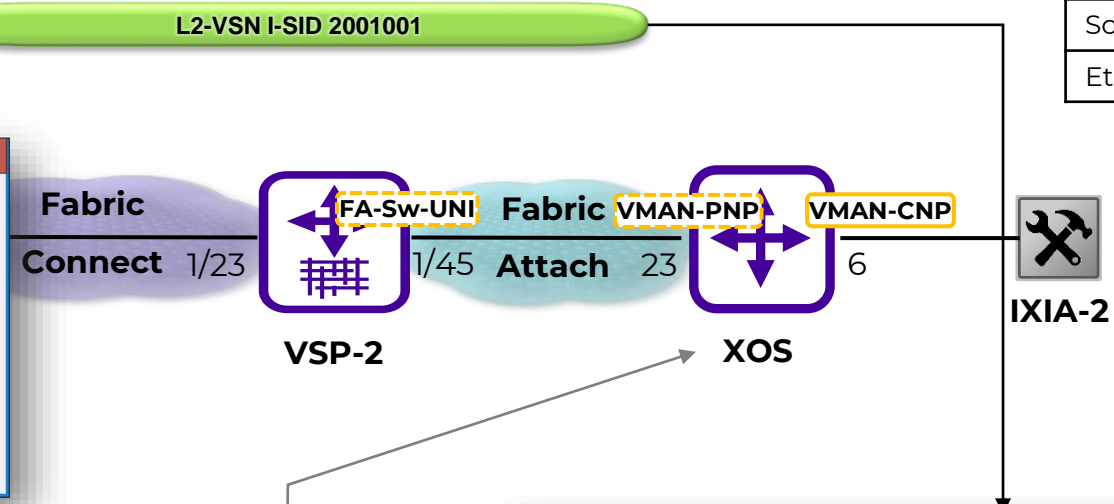
VLAN(s)

VLAN Type: Single VLAN Stack VLAN (Q in Q)

SP-VLAN (Outer)							
VLAN ID	Priority	CFI	VLAN ID Count Mode	Repeat Count	Step	Tag Protocol ID	Tag Control Info
1001	0	Reset	Fixed	10	1	0x8100	03 E9

CE-VLAN (Inner)							
VLAN ID	Priority	CFI	VLAN ID Count Mode	Repeat Count	Step	Tag Protocol ID	Tag Control Info
20	0	Reset	Fixed	10	1	0x8100	00 14

OK Cancel Advanced >>



```
interface GigabitEthernet 1/6
  flex-uni enable
exit
i-sid 2001001 elan
  c-vid 1001 port 1/6
exit
i-sid name 2001001 Cust1
```

```
configure vman ethertype 0x8100 primary
configure vlan 1 delete ports all
create vman cust1 tag 1001
configure vlan 1001 add isid 2001001
configure vman cust1 add ports 6 untagged
```

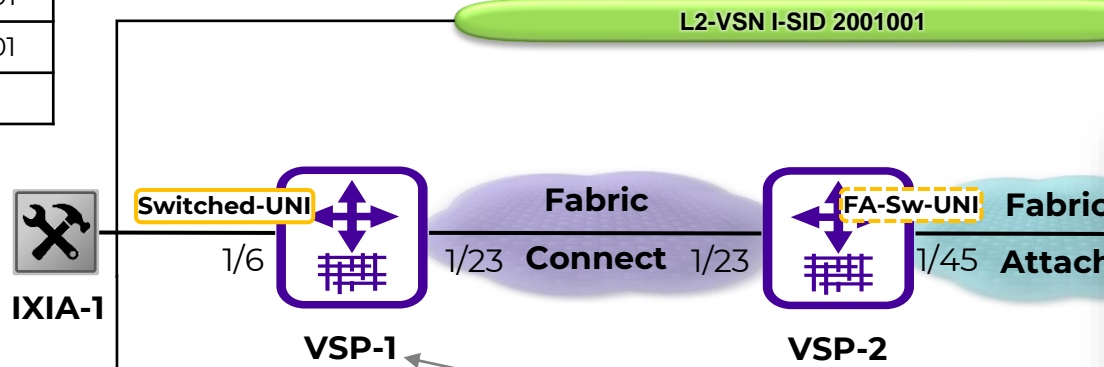
```
Ethernet II, Src: 00:11:00:00:00:01 (00:11:00:00:00:01), Dst: 00:11:00:00:00:02 (00:11:00:00:00:02)
  • Destination: 00:11:00:00:00:02 (00:11:00:00:00:02)
  • Source: 00:11:00:00:00:01 (00:11:00:00:00:01)
  • Type: 802.1Q Virtual LAN (0x8100)
802.1Q Virtual LAN
  • 000. .... = Priority: 0
  • ...0 .... = CFI: 0
  • .... 0000 0001 0100 = ID: 20
  • Type: IP (0x0800)
Internet Protocol
```

Q-in-Q with Fabric Connect + Fabric Attach + XOS VMAN



Q-in-Q frame	
Source MAC 00:11:00:00:00:01	
Ethertype 81:00	S-tag 1001
Ethertype 81:00	C-tag 20

Regular Q-tagged frame	
Source MAC 00:11:00:00:00:02	
Ethertype 81:00	C-tag 20



VLAN(s)

VLAN Type: Single VLAN Stack VLAN (Q in Q)

VLAN ID	User Priority	CFI	VLAN ID Count Mode	Repeat Count	Step	Tag Protocol ID	Tag Control Info
20	0	Reset	Fixed	10	1	0x8100	00 14

OK Cancel

```

Ethernet II, Src: 00:11:00:00:00:02 (00:11:00:00:00:02), Dst: 00:11:00:00:00:01 (00:11:00:00:00:01)
  • Destination: 00:11:00:00:00:01 (00:11:00:00:00:01)
  • Source: 00:11:00:00:00:02 (00:11:00:00:00:02)
  • Type: 802.1Q Virtual LAN (0x8100)
802.1Q Virtual LAN
  • 000. .... = Priority: 0
  • ...0 .... = CFI: 0
  • ... 0011 1110 1001 = ID: 1001
  • Type: 802.1Q Virtual LAN (0x8100)
802.1Q Virtual LAN
  • 000. .... = Priority: 0
  • ...0 .... = CFI: 0
  • ... 0000 0001 0100 = ID: 20
  • Type: IP (0x0800)
Internet Protocol
    
```

```

interface GigabitEthernet 1/6
  flex-uni enable
exit
i-sid 2001001 elan
  c-vid 1001 port 1/6
exit
i-sid name 2001001 Cust1
    
```

```

configure vman ethernet 0x8100 primary
configure vlan 1 delete ports all
create vman cust1 tag 1001
configure vlan 1001 add isid 2001001
configure vman cust1 add ports 6 untagged
    
```