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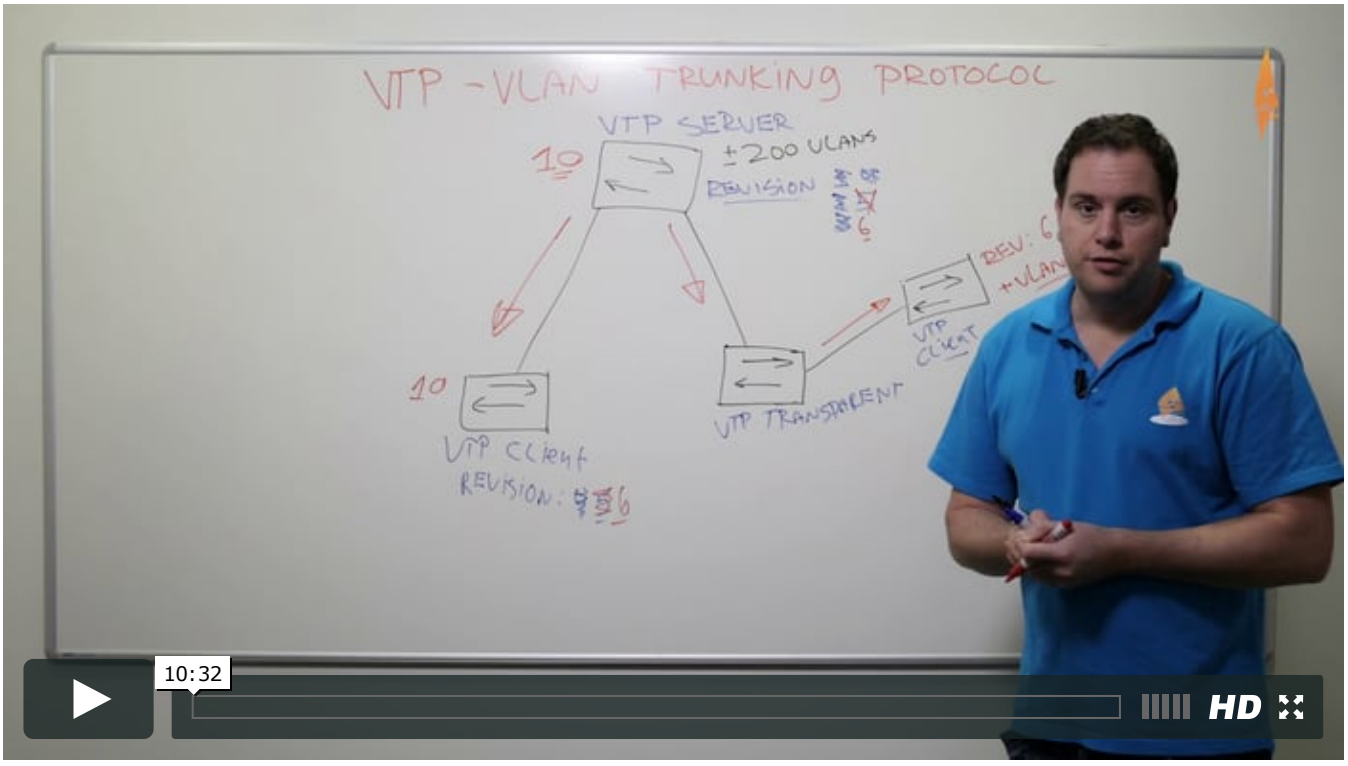
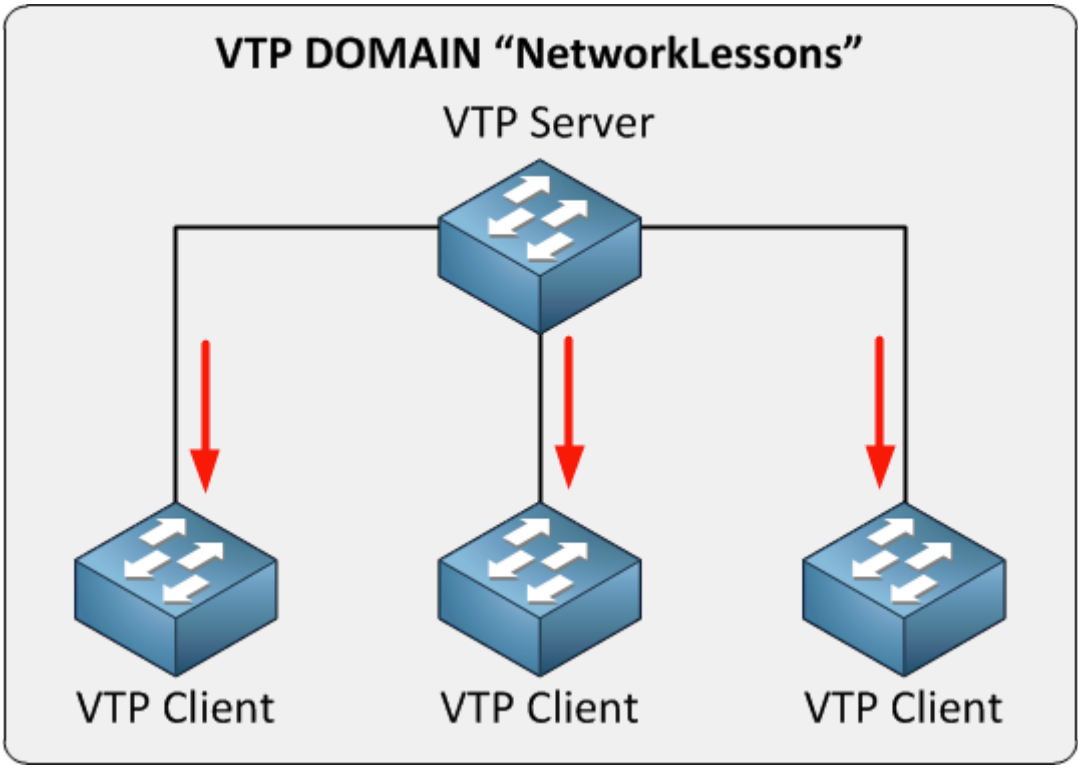
CCIE Routing & Switching

Introduction to VTP (VLAN Trunking Protocol)

17 votes

Let's say you have a network with 20 switches and 50 VLANs. Normally you would have to configure each switch separately and create those VLANs on each and every switch. That's a time consuming task so there is something to help us called **VTP** (VLAN Trunking Protocol). VTP will let you create VLANs on one switch and all the other switches will synchronize themselves.



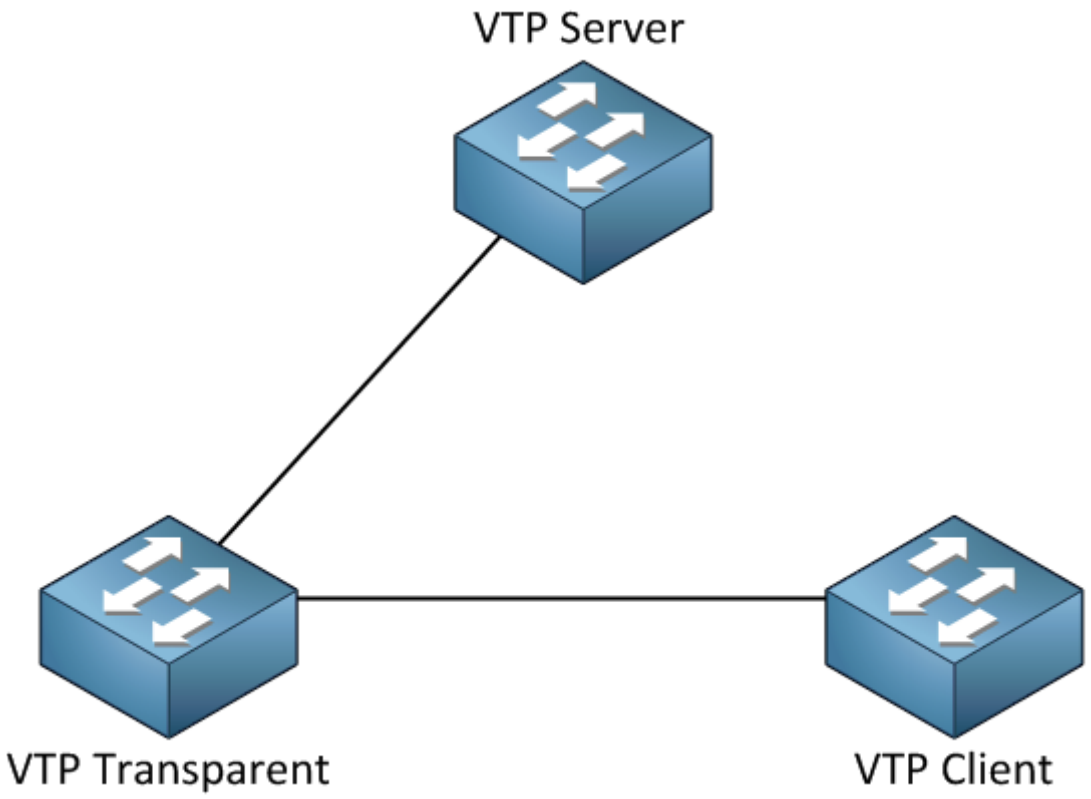


We have one VTP server which is the switch where you create / modify or delete VLANs. The other switches are VTP clients. The VTP configuration has a revision number which will increase when you make a change. Every time you make a change on the VTP server this will be synchronized to the VTP clients. Oh and by the way you can have multiple VTP servers since it also functions as a VTP client so you can make changes on multiple switches in your network. In order to make VTP work you need to setup a VTP domain name which is something you can just make up, as long as you configure it to be the same on all your switches.

This is the short version of what I just described:

1. VTP adds / modifies / deletes VLANs.
2. For every change the revision number will increase.
3. The latest advertisement will be sent to all VTP clients.
4. VTP clients will synchronize themselves with the latest information.

Besides the VTP server and VTP client there's also a VTP transparent which is a bit different, let me show you an example:



Our VTP Transparent will forward advertisements but will **not synchronize** itself. You can create VLANs locally though which is impossible on the VTP client. Let's say you create VLAN 20 on our VTP server, this is what will happen:

1. You create VLAN 20 on the VTP server.
2. The revision number will increase.
3. The VTP server will forward the latest advertisement which will reach the VTP transparent switch.
4. The VTP transparent will not synchronize itself but will forward the advertisement to the VTP client.
5. The VTP client will synchronize itself with the latest information.

Here's an overview of the 3 VTP modes:

	VTP Server	VTP Client	VTP Transparent
Create/Modify/Delete VLANs	Yes	No	Only local
Synchronizes itself	Yes	Yes	No
Forwards advertisements	Yes	Yes	Yes

Should you use VTP? It might sound useful but VTP has a big security risk…the problem with VTP is that a VTP server is also a VTP Client and any VTP client will synchronize itself with the highest revision number. The following situation can happen with VTP:

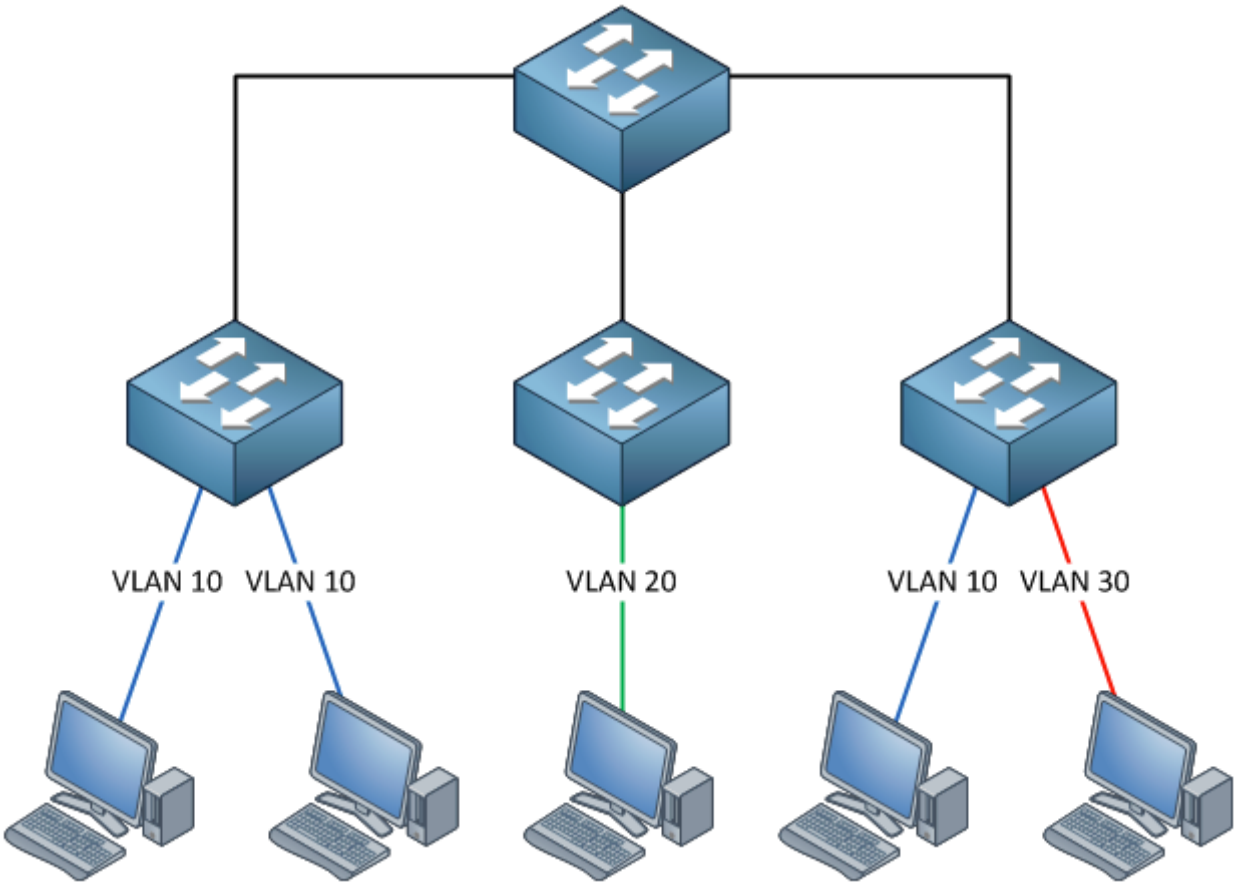
You have a network with a single VTP server and a couple of VTP client switches, everything is working fine but one day you want to test some stuff and decide to take one of the VTP clients out of the network and put it in a lab environment.

1. You take the VTP client switch out of the network.
2. You configure it so it's no longer a VTP Client but a VTP server.
3. You play around with VTP, create some VLANs, modify some.
4. Every time you make a change the revision number increases.
5. You are done playing…you delete all VLANs.
6. You configure the switch from VTP Server to VTP Client.
7. You connect your switch to your production network.

What do you think the result will be? The revision number of VTP on the switch we played with is higher than the revision number on the switches of our production network. The VTP client will advertise its information to the other switches, they synchronize to the latest information and POOF all your VLANs are gone! A VTP client can **overwrite** a VTP server if the revision number is higher because a VTP server is also a VTP client.

Yes I know this sounds silly but this is the way it works…very dangerous since you'll lose all your VLAN information. Your interfaces won't go back to VLAN 1 by default but will float around in no man's land…

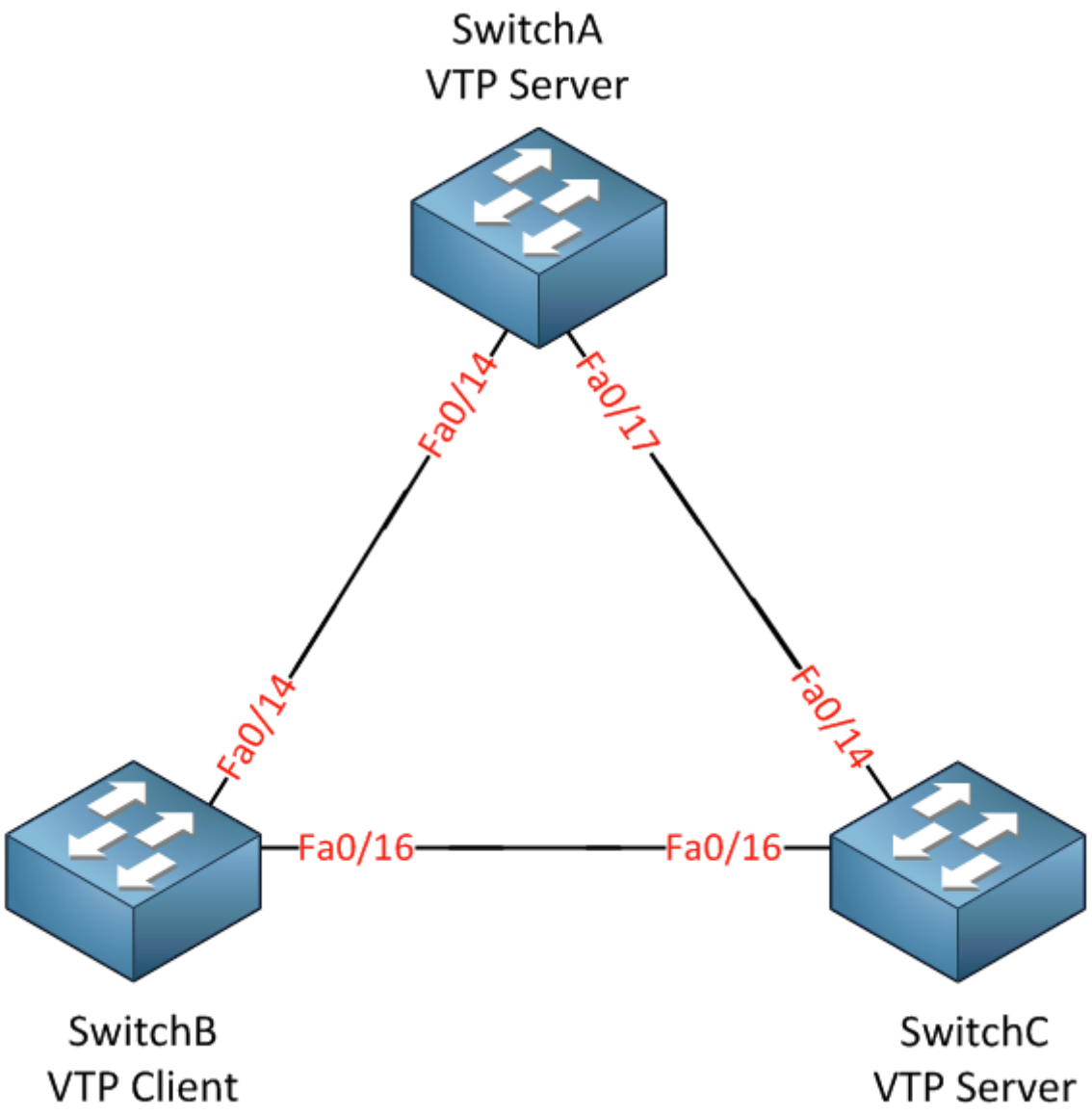
One more thing about VTP, let me give you another picture:



You see we have computers in VLAN 10, 20 and 30. The links between the switches are trunks using the 802.1Q protocol and carrying all VLAN traffic. One of our computers in VLAN 10 sends a broadcast frame, where do you think this broadcast frame will go?

Broadcast frames have to be flooded by our switches and since our trunks are carrying all VLANs, this broadcast will go everywhere. However if you look at the switch in the middle do you see any computer in VLAN 10? Nope there's only VLAN 20 there which means this broadcast is wasted bandwidth. By enabling **VTP pruning** we'll make sure there is no unnecessary VLAN traffic on trunks when there's nobody in a particular VLAN. Depending on your switch model VTP pruning is either turned on or off by default.

Let's take a look at the configuration of VTP. I will be using three switches for this task. I erased the VLAN database and the startup-configuration on all switches.




```
SwitchA#show vtp status
VTP Version                     : running VTP1 (VTP2 capable)
Configuration Revision          : 0
Maximum VLANs supported locally : 1005
Number of existing VLANs        : 5
VTP Operating Mode              : Server
VTP Domain Name                 :
VTP Pruning Mode                : Disabled
VTP V2 Mode                     : Disabled
VTP Traps Generation            : Disabled
MD5 digest                      : 0x57 0xCD 0x40 0x65 0x63 0x59 0x47 0xBD
Configuration last modified by 0.0.0.0 at 0-0-00 00:00:00
Local updater ID is 0.0.0.0 (no valid interface found)
```

```
SwitchB#show vtp status
```

```
VTP Version                     : running VTP1 (VTP2 capable)
Configuration Revision          : 0
Maximum VLANs supported locally : 1005
Number of existing VLANs        : 5
VTP Operating Mode              : Server
VTP Domain Name                 :
VTP Pruning Mode                : Disabled
VTP V2 Mode                     : Disabled
VTP Traps Generation            : Disabled
MD5 digest                      : 0x57 0xCD 0x40 0x65 0x63 0x59 0x47 0xBD
Configuration last modified by 0.0.0.0 at 0-0-00 00:00:00
Local updater ID is 0.0.0.0 (no valid interface found)
```

```
SwitchC#show vtp status
VTP Version                     : 2
Configuration Revision          : 0
Maximum VLANs supported locally : 1005
Number of existing VLANs        : 5
VTP Operating Mode              : Server
VTP Domain Name                 :
VTP Pruning Mode                : Disabled
VTP V2 Mode                     : Disabled
VTP Traps Generation            : Disabled
MD5 digest                      : 0x57 0xCD 0x40 0x65 0x63 0x59 0x47 0xBD
Configuration last modified by 0.0.0.0 at 0-0-00 00:00:00
Local updater ID is 0.0.0.0 (no valid interface found)
```

Depending on the switch model you will see a similar output if you use the **show vtp status** command. There's a couple of interesting things to see here:

- Configuration revision 0: Each time we add or remove VLANs this number will change. It's 0 at the moment since I haven't created or removed any VLANs.
- VTP Operating mode: the default is VTP server.
- VTP Pruning: this will help to prevent unnecessary traffic on your trunk links, more in this later.
- VTP V2 Mode: The switch is capable of running VTP version 2 but it's currently running VTP version 1.

```
SwitchA(config)#vlan 10
SwitchA(config-vlan)#name Printers
```

Let's create a VLAN on SwitchA and we'll see if anything changes...

```
SwitchA#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, Fa0/22
                                                Fa0/23, Fa0/24, Gi0/1, Gi0/2
10   Printers                         active
```

My new VLAN shows up in the VLAN database, so far so good...

```
SwitchA#show vtp status
VTP Version                     : running VTP1 (VTP2 capable)
Configuration Revision          : 1
```

You can see that the configuration revision has increased by one.

```
SwitchB#show vtp status
VTP Version                     : running VTP1 (VTP2 capable)
Configuration Revision          : 0
```

```
SwitchC#show vtp status
VTP Version                     : 2
Configuration Revision          : 0
```

Unfortunately nothing has changed on SwitchB and SwitchC. This is because we need to configure a **VTP domain-name** before it starts working.

```
SwitchB#debug sw-vlan vtp events
```

```
vtp events debugging is on
```

```
SwitchC#debug sw-vlan vtp events
vtp events debugging is on
```

Before I change the domain-name I'm going to enable a debug using the **debug sw-vlan vtp events** command. This way we can see in real-time what is going on.

```
SwitchA(config)#vtp domain NETWORKLESSONS
Changing VTP domain name from NULL to NETWORKLESSONS
```

```
SwitchB#
VTP LOG RUNTIME: Summary packet received in NULL domain state
VTP LOG RUNTIME: Summary packet received, domain = NETWORKLESSONS, rev = 1,
followers = 1, length 77, trunk Fa0/16
VTP LOG RUNTIME: Transitioning from NULL to NETWORKLESSONS domain
VTP LOG RUNTIME: Summary packet rev 1 greater than domain NETWORKLESSONS rev 0
```

You will see the following debug information on SwitchB and SwitchC; there are two interesting things we can see here:

- The switch receives a VTP packet from domain "NETWORKLESSONS" and decides to change its own domain-name from "NULL" (nothing) to "NETWORKLESSONS". It will only change the domain-name if it doesn't have a domain-name.
- The switch sees that the VTP packet has a higher revision number (1) than what it currently has (0) and as a result it will synchronize itself.

```
SwitchB#no debug all
All possible debugging has been turned off
```

```
SwitchC#no debug all
All possible debugging has been turned off
```

Make sure to disable the debug output before you get flooded with information.

```
SwitchB#show vtp status
VTP Version                     : running VTP1 (VTP2 capable)
Configuration Revision          : 1
```

```
SwitchC#show vtp status
VTP Version                     : 2
Configuration Revision          : 1
```

The revision number on SwitchB and SwitchC is now “1”.

```
SwitchB#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,
                                                 Fa0/23, Fa0/24, Gi0/1, Gi0/2
10   Printers                          active
```

```
SwitchC#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
                                                 Fa0/20, Fa0/22, Fa0/23,
                                                 Gi0/1, Gi0/2
10   Printers                          active
```

The show vlan command tells us that SwitchB and SwitchC have learned VLAN 10 through VTP.

Since all switches are in VTP Server mode I can create VLANs on any switch and they should all synchronize:

```
SwitchB(config)#vlan 20
SwitchB(config-vlan)#name Servers
```

```
SwitchC(config)#vlan 30
SwitchC(config-vlan)#name Management
```

Let's create VLAN 20 on SwitchB and VLAN 30 on SwitchC.

```
SwitchA#show vlan
VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
-
10   Printers                         active
20   Servers                          active
30   Management                       active
```

```
SwitchB#show vlan
VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
-
10   Printers                         active
20   Servers                          active
30   Management                       active
```

```
SwitchC#show vlan
VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
-
10   Printers                         active
20   Servers                          active
30   Management                       active
```

As you can see all switches know about the VLANs. What about the revision number? Did it change?

```
SwitchA#show vtp status
```

```
VTP Version                     : running VTP1 (VTP2 capable)
Configuration Revision          : 3
```

```
SwitchB#show vtp status
VTP Version                     : running VTP1 (VTP2 capable)
Configuration Revision          : 3
```

```
SwitchC#show vtp status
VTP Version                     : 2
Configuration Revision          : 3
```

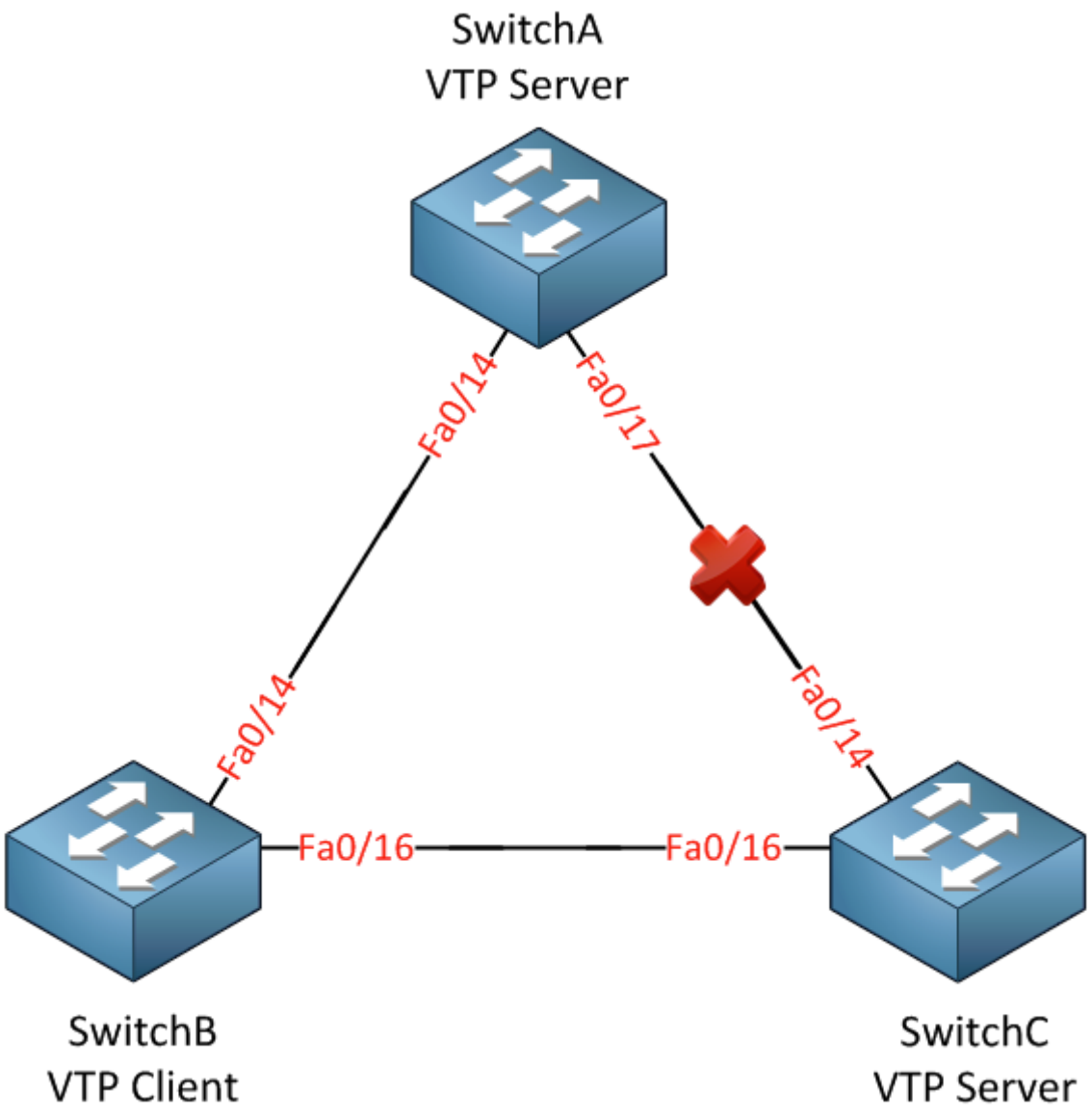
Each time I create another VLAN the revision number increases by one. Let's change the VTP mode on SwitchB to see what it does.

```
SwitchB(config)#vtp mode client
Setting device to VTP CLIENT mode.
```

```
SwitchB#show vtp status
VTP Version                     : running VTP1 (VTP2 capable)
Configuration Revision          : 3
Maximum VLANs supported locally : 1005
Number of existing VLANs        : 7
VTP Operating Mode              : Client
```

It's now running in VTP Client mode.

Right now SwitchA and SwitchC are in VTP Server mode. SwitchB is running VTP Client mode. I have disconnected the link between SwitchA and SwitchC so there is no direct connection between them.



I'll create another VLAN on SwitchA so we can see if SwitchB and SwitchC will learn it.

```
SwitchA(config)#vlan 40
SwitchA(config-vlan)#name Engineering
```

I'll call the new VLAN "Engineering".

```
SwitchB#show vlan
VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
-
10   Printers                         active
20   Servers                          active
30   Management                       active
40   Engineering                      active
```

SwitchB learns about VLAN 40 through SwitchA.

```
SwitchC#show vlan
VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
-
10   Printers                         active
20   Servers                          active
30   Management                       active
40   Engineering                      active
```

SwitchC learns about VLAN 40 through SwitchB. SwitchB as a VTP client will synchronize itself but it will also forward VTP advertisements.

```
SwitchB(config)#vlan 50
%VTP VLAN configuration not allowed when device is in CLIENT mode.
```

A switch running in VTP Client mode is unable to create VLANs so that's why I get this error if I try to create one.

What about the VTP Transparent mode? That's the last one we have to try...

I'll change SwitchB to VTP Transparent mode and the link between SwitchA and SwitchC is still disconnected.

```
SwitchB(config)#vtp mode transparent
Setting device to VTP TRANSPARENT mode.
```

This is how we change SwitchB to VTP Transparent mode.

```
SwitchA(config)#vlan 50
SwitchA(config-vlan)#name Research
```

Let's create VLAN 50 for this experiment on SwitchA.

```
SwitchA#show vlan
VLAN Name                             Status    Ports
```

```
---- -------------------------------- --------- -------------------------------
-
10   Printers                         active
20   Servers                          active
30   Management                       active
40   Engineering                      active
50   Research                         active
```

It shows up on SwitchA as expected.

```
SwitchB#show vlan
VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
-
10   Printers                         active
20   Servers                          active
30   Management                       active
40   Engineering                      active
```

It doesn't show up on SwitchB because it's in VTP transparent mode and doesn't synchronize itself.

```
SwitchC#show vlan
VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
-
10   Printers                         active
20   Servers                          active
30   Management                       active
40   Engineering                      active
50   Research                         active
```

It does show up on SwitchC! A switch in VTP Transparent mode will **not synchronize itself** but it will **forward VTP advertisements** to other switches so they can synchronize themselves.

What will happen if I create a VLAN on SwitchB? Let's find out!

```
SwitchB(config)#vlan 60
```

```
SwitchB(config-vlan)#name Cameras
```

```
SwitchB#show vlan
VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
-
10   Printers                         active
20   Servers                          active
30   Management                       active
40   Engineering                      active
50   Research                         active
60   Cameras                          active
```

We can create this new VLAN on SwitchB without any trouble. It's in VTP Transparent mode so we can do this.

```
SwitchA#show vlan
VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
-
10   Printers                         active
20   Servers                          active
30   Management                       active
40   Engineering                      active
50   Research                         active
```

```
SwitchC#show vlan
VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
-
10   Printers                         active
20   Servers                          active
30   Management                       active
40   Engineering                      active
50   Research                         active
```

VLAN 60 doesn't show up on SwitchA and SwitchC because SwitchB is in VTP Transparent mode. SwitchB will not advertise its VLANs because they are only **known locally.**

Is there anything else you need to know about VTP Transparent mode?

```
SwitchB#show running-config
Building configuration...
vlan 10
 name Printers
!
vlan 20
 name Servers
!
vlan 30
 name Management
!
vlan 40
 name Engineering
!
vlan 60
 name Cameras
```

There's a difference between VTP Transparent mode VS Server/Client mode. If you look at the running-config you will see that VTP Transparent stores all VLAN information in the running-config. VTP Server and Client mode store their information in the VLAN database (vlan.dat on your flash memory).

That's all I have about VTP for now. I hope you enjoyed this article and that it was useful to you! If you have any questions feel free to leave a comment below.

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- July 15, 2013 at 13:06 #15265 Reply

Alina
Hi, thanks. This is good and useful article.

September 12, 2013 at 12:00 #15266 Reply

Vijay verma
This topic clearifies different mode beautifully without any boredom

November 8, 2013 at 10:10 #15267 Reply

Rima
why we don’t use vtp in each network ?
can we use in big network?

November 11, 2013 at 09:55 #15268 Reply

Rene Molenaar
Keymaster

You can use it but it has a security risk, a VTP client is able to overwrite the VTP server when its revision number is higher. It's possible to wipe the VLAN Database on all your switches this way…

December 3, 2013 at 02:16 #15269 Reply

EMMA K
Participant
That is how one can do it once you have full understanding of the content.
Great job man.
Please help me with CCNA in this month.

Can you provide commands for the experiments please?

April 7, 2014 at 11:24 #15270 Reply

el abra
Very good,
it's a good lessons , thank's a lot

April 14, 2014 at 11:16 #15271 Reply

Rene Molenaar
Keymaster
You are welcome!

June 15, 2014 at 07:35 #15272 Reply

Bavarian
Thank you dude it can't be explained better 🙂

June 15, 2014 at 07:43 #15273 Reply

Bavarian
May i ask what happens if the server and client are on different domains ?

June 17, 2014 at 13:36 #15274 Reply

Rene Molenaar
Keymaster
You will have a mismatch and no synchronization will occur.

December 11, 2014 at 10:26 #15276 Reply

kiran g
Member
Very good explanation Rene, Interesting.

January 24, 2015 at 21:03 #15278 Reply

ALFREDO V
Participant
Hi Rene,

I know that if you have"SWA" as a VTP Server with 200 vlans and you want to synchronized to SW#B and SW#C as clients will synchronized the Server vlans. I learned that once you synchronized the SW#A,SW#B & SW#C you can change them to VTP Transparent mode to avoid the problem of plugging a switch with other vlan database.
One of my friends played with a cisco switch at work, created a lot of vlans then one day the one of the companie's switch went down then He grab the one using for practice, plug it and brought down the network with 40 switches, fortunately they had a back up of the vlans database and in hours they were up and running.

January 26, 2015 at 21:46 #15280 Reply

Rene Molenaar
Keymaster
Hi Alfredo,

That's the best way of doing it..set it up, sync everything and then turn the switches to VTP transparent (or disable it). I've also seen it happen before that all VLANs were removed...it's a pain 🙂

Rene

March 20, 2015 at 17:28 #15282 Reply

Seamus K
Participant
if adding a new switch to the network, change the revision to 0 or to a lower revision than the Server.

March 20, 2015 at 17:31 #15285 Reply

Seamus K
Participant
Not enough detail in this lesson for CCNP Switch! It's fine for CCNA.

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