MSTP

(Multiple Spanning Tree Prococol)

Ethernet Switch

ZyNOS 4.0

Support Notes

Version 4.0

July 2011

ZyXEL

Unleash Networking Power

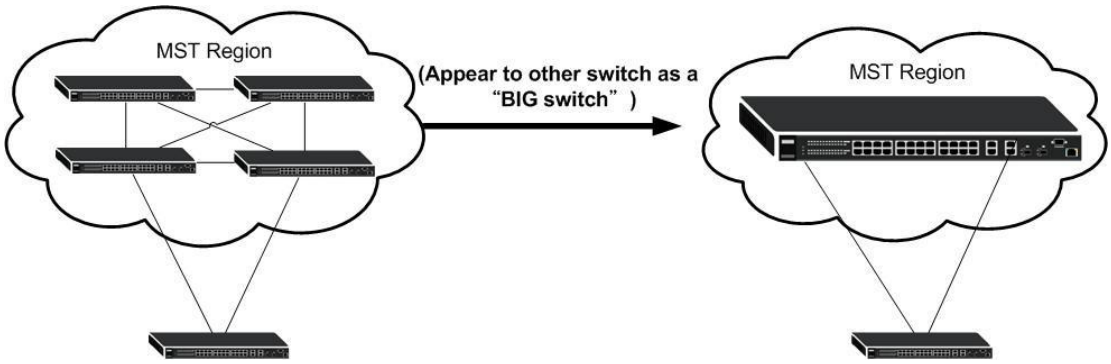
Overview of MSTP

Multiple Spanning Tree Protocol (IEEE 802.1s) is backward compatible with STP/RSTP and addresses the limitations of existing spanning tree protocols (STP and RSTP) in networks to include the following features:

- One Common and Internal Spanning Tree (CIST) that represents the entire network's connectivity.
- Grouping of multiple bridges (or switching devices) into regions that appear as one single bridge on the network.
- A VLAN can be mapped to a specific Multiple Spanning Tree Instance (MSTI). MSTI allows multiple VLANs to use the same spanning tree.
- Load-balancing is possible as traffic from different VLANs can use distinct paths in a region.

MST Region:

An MST region is a logical grouping of multiple network devices that appears as a single device to the rest of the network. Each MSTP-enabled device can only belong to one MST region.



MST Instance:

An MST Instance (MSTI) is a spanning tree instance. VLANs can be configured to run on a specific MSTI. Each created MSTI is identified by a unique number (known as an MST ID) known internally to a region. Thus an MSTI does not span across MST regions.

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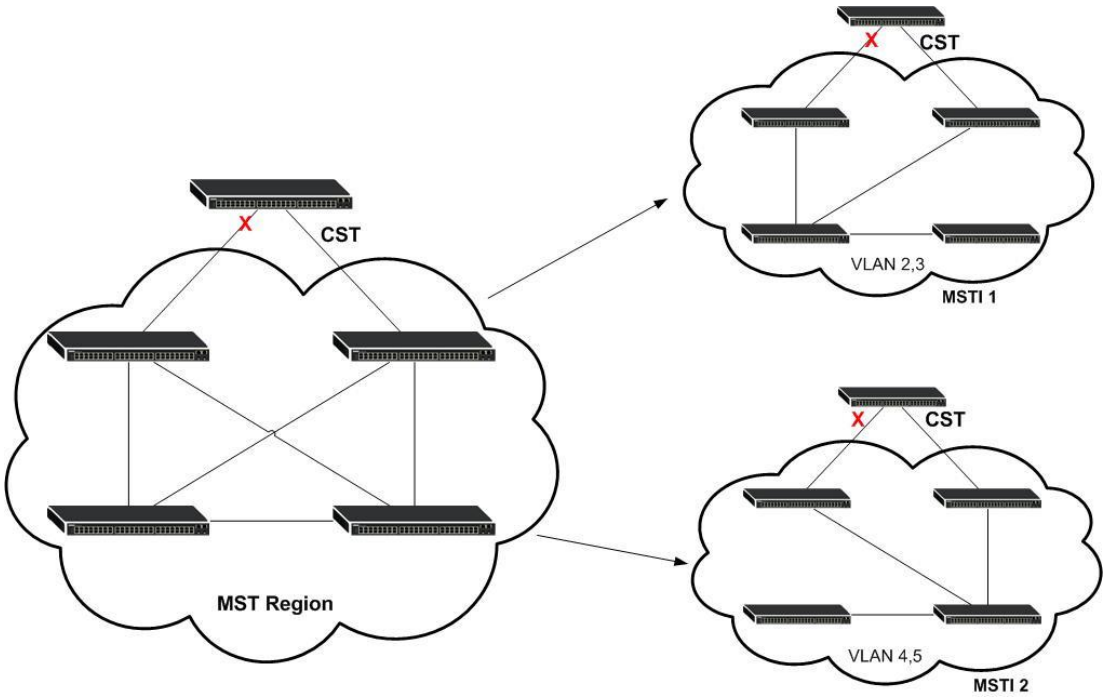
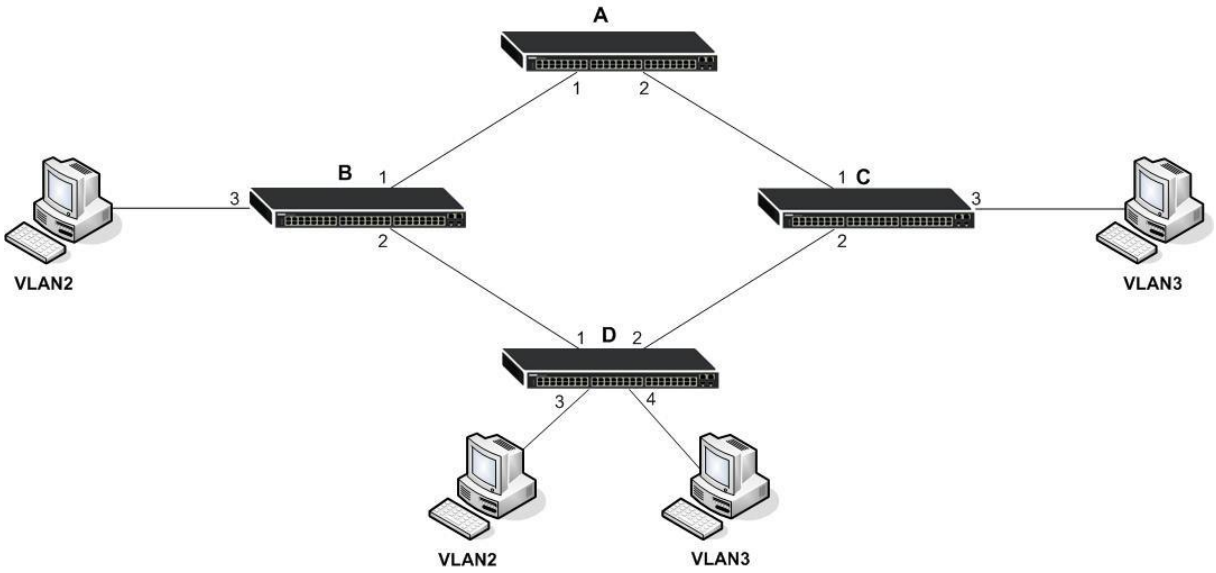


This MST Region can be decomposite into two MSTIs. One for vlan 2,3 , and another for vlan 4,5. Different MSTIs have different topologies.

Scenario&Benefits

Consider the following topology:



If we use STP/RSTP in this topology. All traffics from D to hosts connect to other switches will go through the root port.

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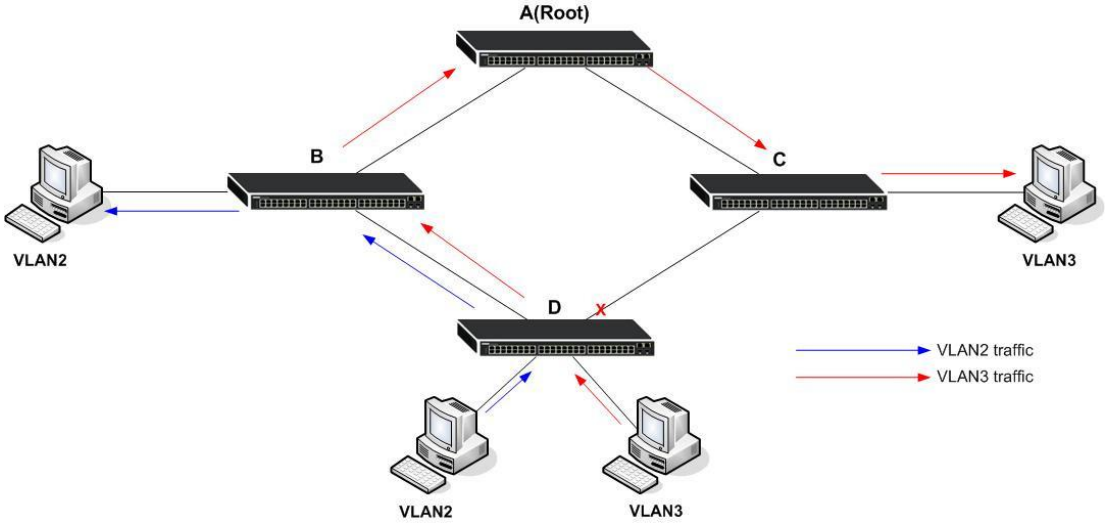
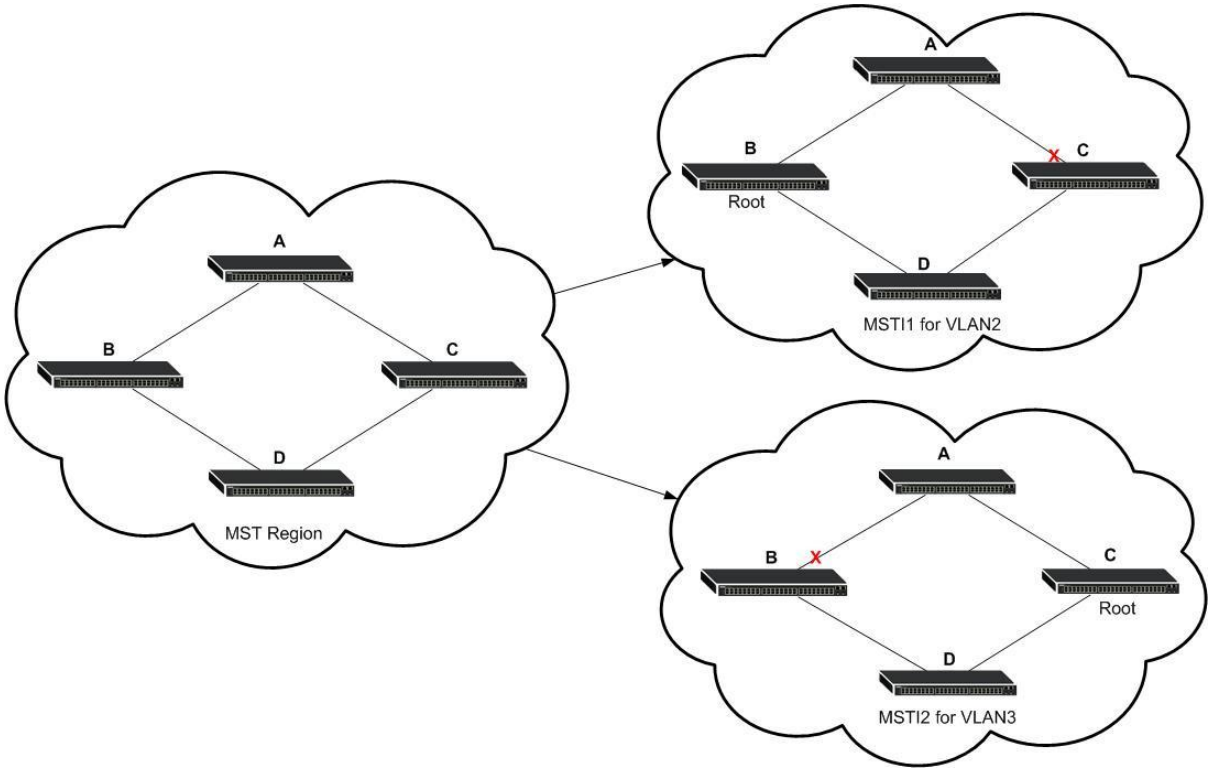
Traffic on STP/RSTP enabled topology.



Now what if we applied MSTP in the same topology?



When there're traffics belong to VLAN2 and VLAN3. Each of them can go through different uplinks.

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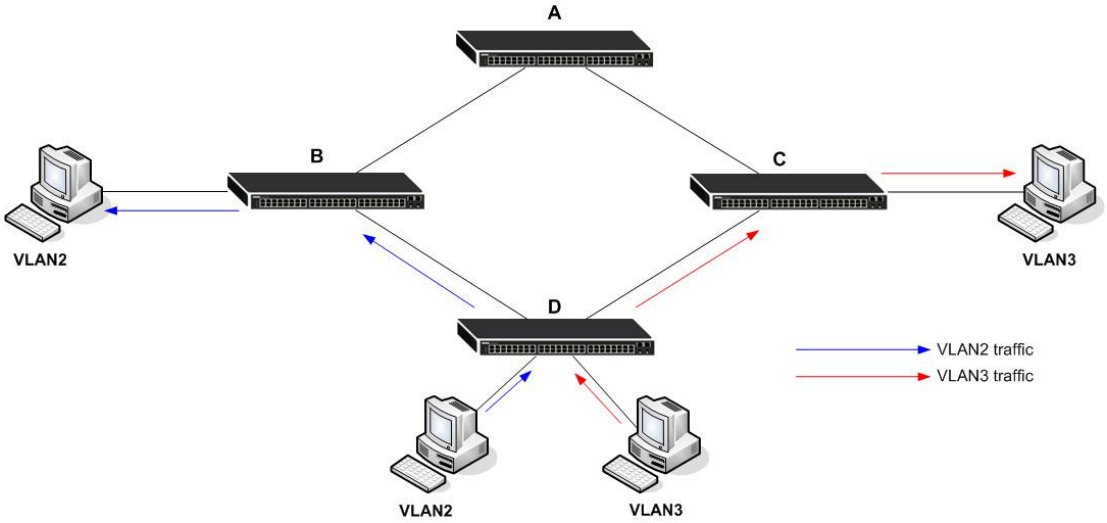

With multiple uplink ports be enabled. The traffic loading will be balanced between two uplink ports, which also increase the network throughput and usage.

Configuration using the Web GUI – Switch A

1. Connect MGMT port with a PC or Notebook via the RJ45 Cable.
2. By default, the MGMT IP of the out-band port is 192.168.0.1/24
3. Set your NIC to 192.168.0.100/24
4. Open an Internet browser (e.g. IE) and enter http://192.168.0.1 in the URL field.
5. By default, the username for the administrator is “admin” and the corresponding password is “1234”.
6. After successful login you will see a screen similar to the one on the screenshot below.

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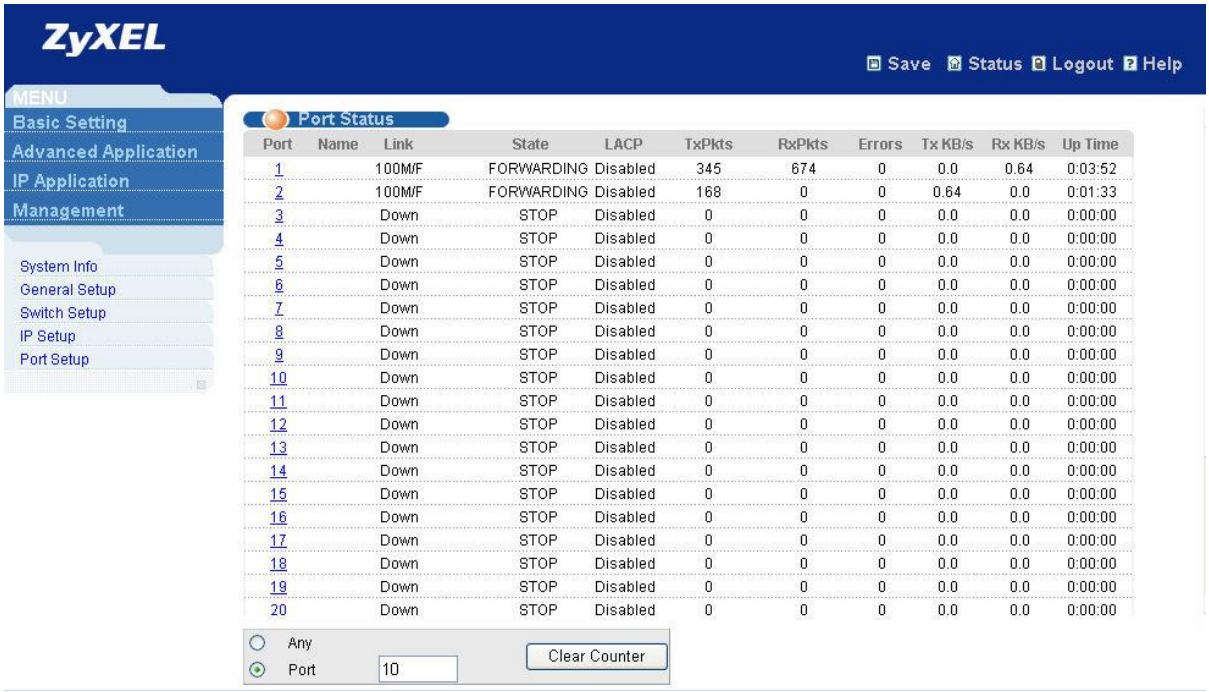
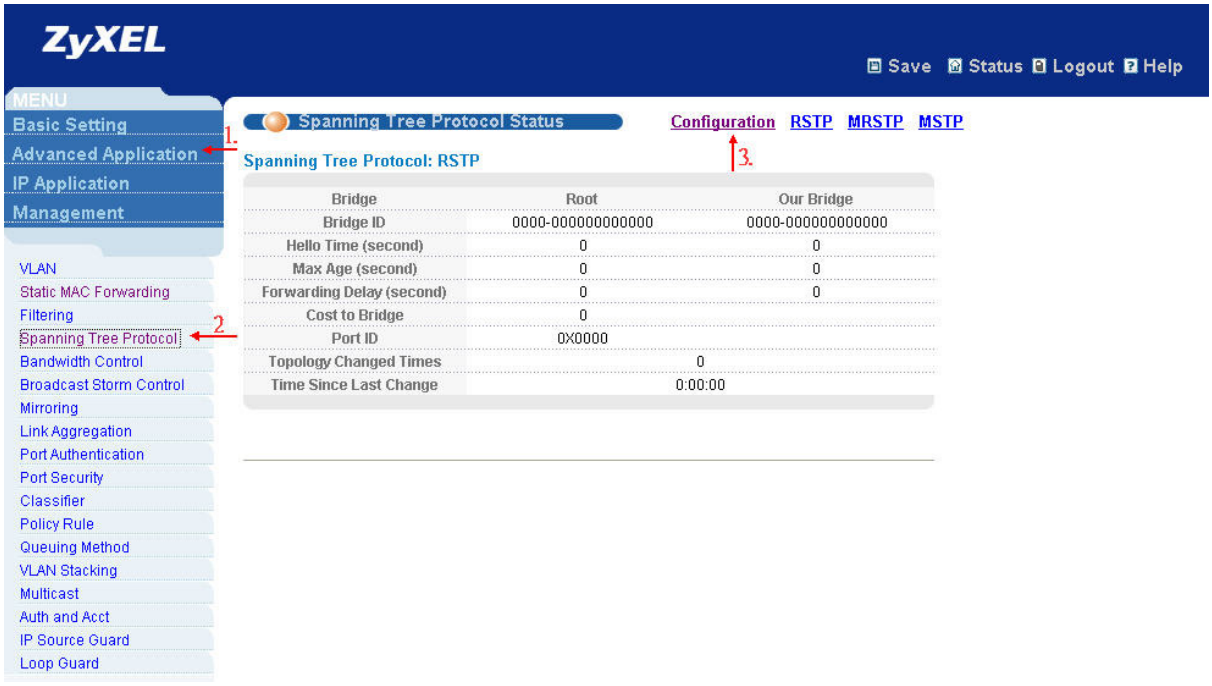


7. First of all, you need to enable the switch's MSTP function. To do so, click items depicted below. **Advanced Application -> Spanning Tree Protocol -> Configuration**



8. After step 7. It will direct you to a "**Spanning Tree Configuration**" page, choose "**Multiple Spanning Tree**" then click the "**Apply**" button.

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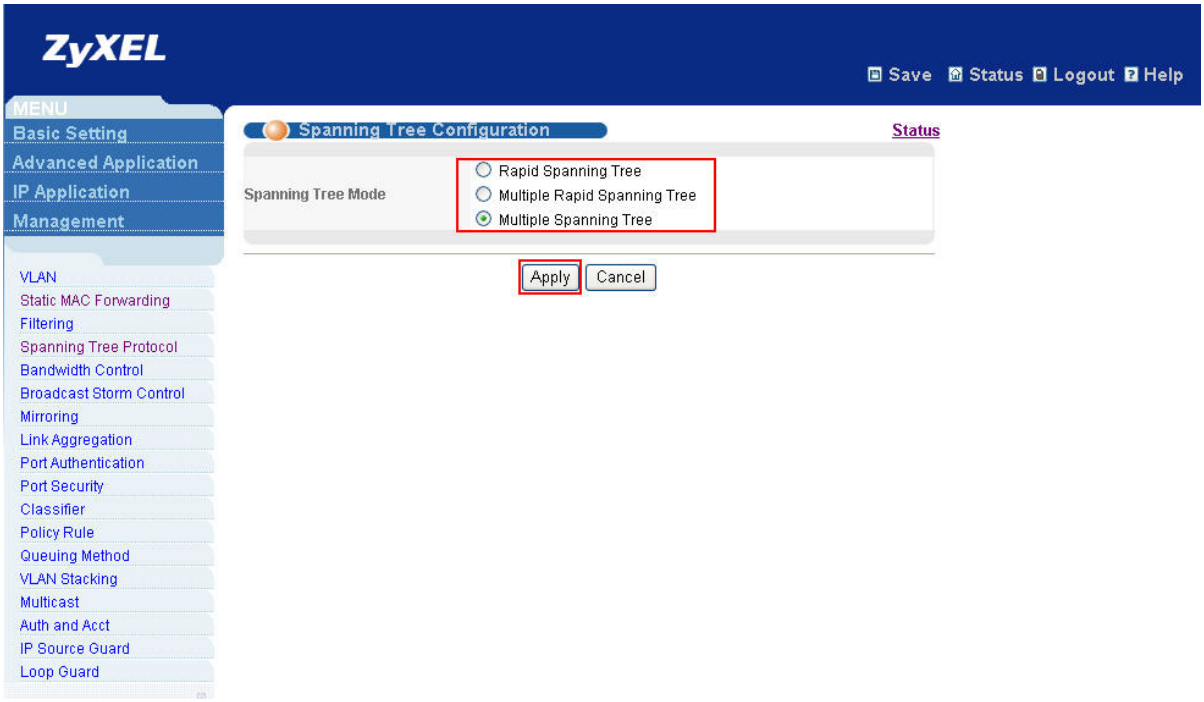

9. Click “**Spanning Tree Protocol**” button and back to “**Spanning Tree Protocol Status**” page. Click “**MSTP”** and go to the “**Multiple Spanning Tree Protocol**” page, you can do detail MSTP configuration from here.

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10. At the “Multiple Spanning Tree Protocol” page, create a MSTI 0 setting by following steps. All ports want to join MSTP must be included into MSTI 0

1.Configure the MSTP bridge parameters. (All switches in the same region must have the same “Configuration Name”, “Revision Number” and “vlan-MSTI mapping”.)

1.) Check “Active”eeHello Time”

3.) Configure the “Max Age” time

4.) Configure the “Forwarding Delay” time

5.) Configure the “Max hops”

6.) Configure the “Configuration Name”

7.) Configure the “Revision Number”

8.) Click “Apply” buttom

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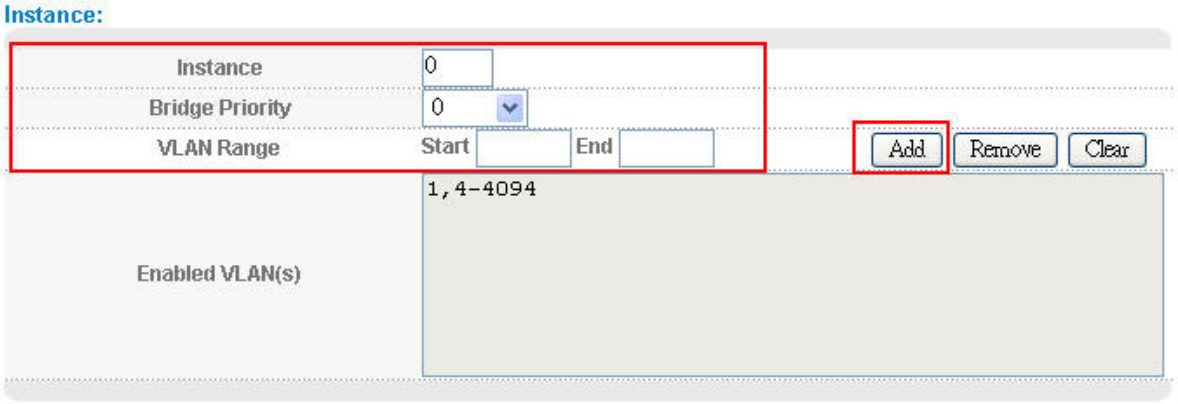
2.Configure the MSTI parameters and choose which vlan should join this MSTI and click “Add”. Because switch A is the root of this region, we must set the “Bridge Priority” of MSTI 0 to “0”



3.Choose which port should be included in this MSTI. Click “Add”

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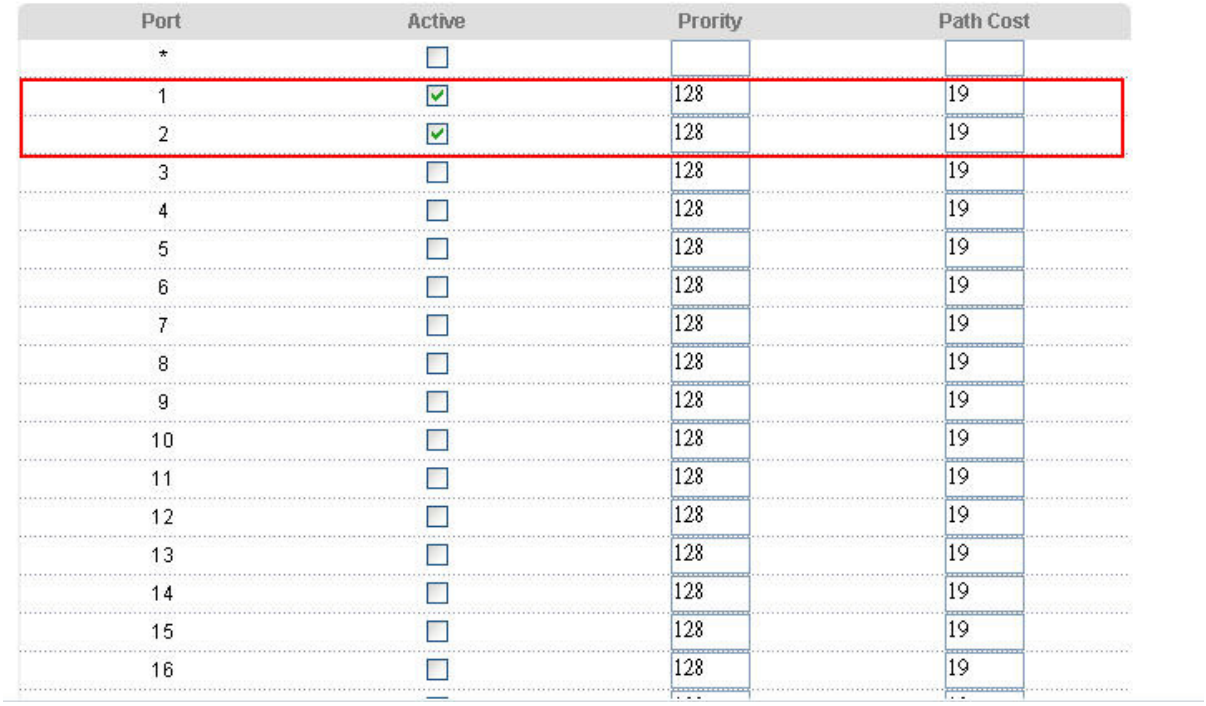

Port	Active	Prority	Path Cost
*	☐		
1	☑	128	19
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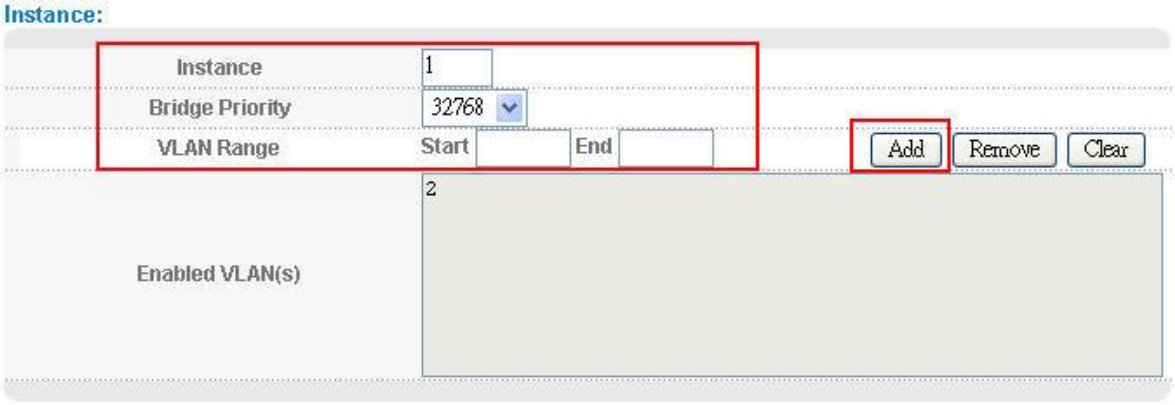
5	☐	128	19
6	☐	128	19
7	☐	128	19
8	☐	128	19
9	☐	128	19
10	☐	128	19
11	☐	128	19
12	☐	128	19
13	☐	128	19
14	☐	128	19
15	☐	128	19
16	☐	128	19

11. At the “Multiple Spanning Tree Protocol” page, create a MSTI 1 setting by following steps.

1.Configure the MSTI parameters and choose which vlan should join this MSTI and click “Add”



2.Choose which port should be included in this MSTI. Click “Add”

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Port	Active	Prority	Path Cost
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9	☐	128	19
10	☐	128	19
11	☐	128	19
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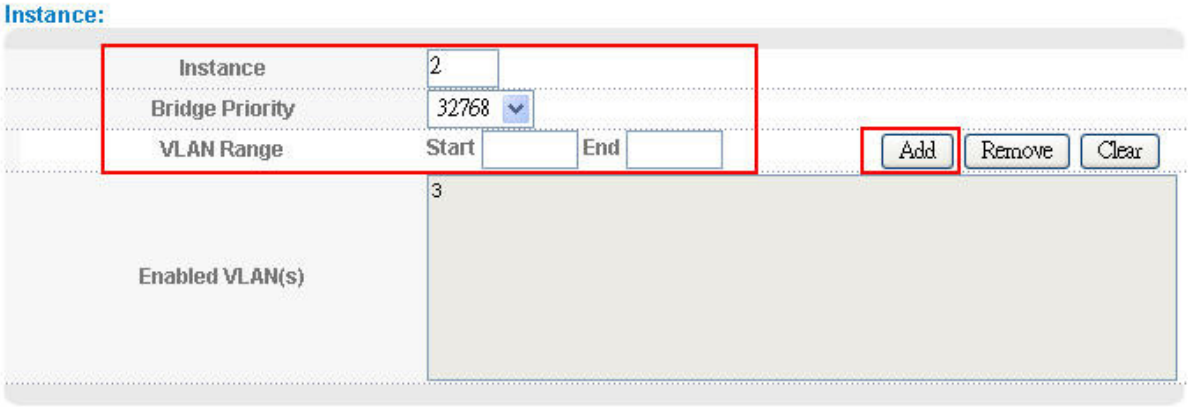

2.Choose which port should be included in this MSTI. Click “Add”

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Port	Active	Prority	Path Cost
*	☐		
1	☑	128	19
2	☑	128	19
3	☐	128	19
4	☐	128	19
5	☐	128	19
6	☐	128	19
7	☐	128	19
8	☐	128	19
9	☐	128	19
10	☐	128	19
11	☐	128	19
12	☐	128	19
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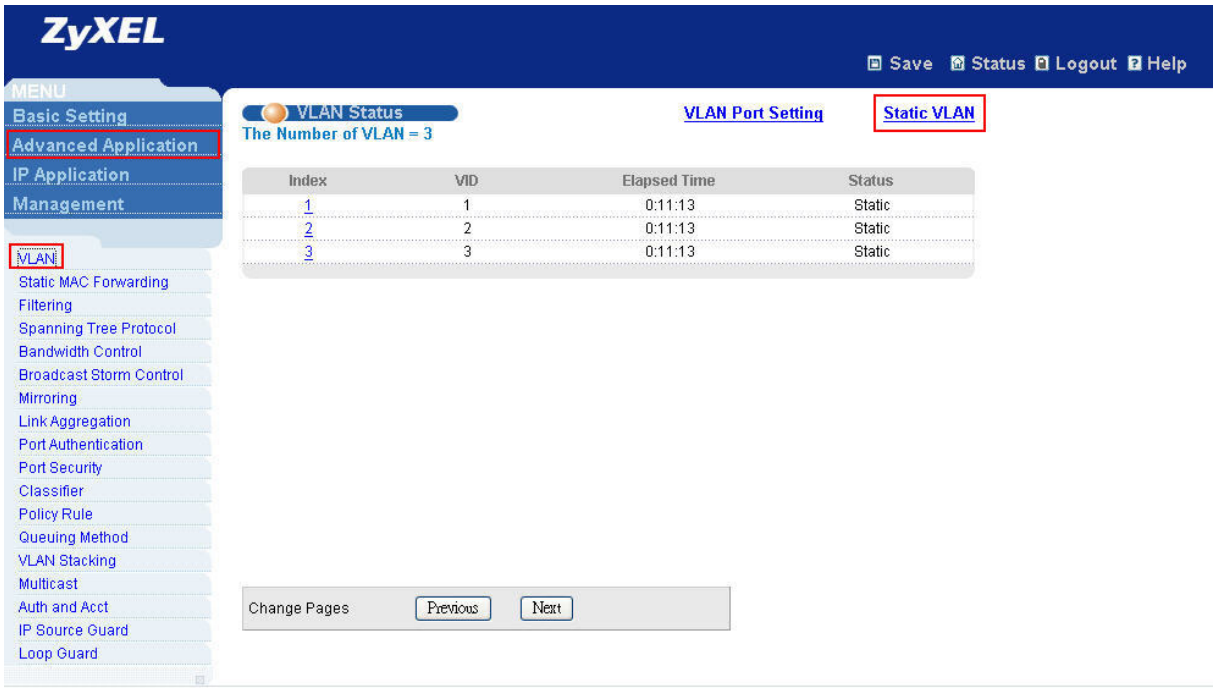
16	☐	128	19

13. Create vlans corresponding to MST instances.

1.)Go to “Static VLAN” page by clicking “Advanced Application” ”VLAN” “Static VLAN”



2.)Create vlan 2 for MSTI 1 and click “Add”

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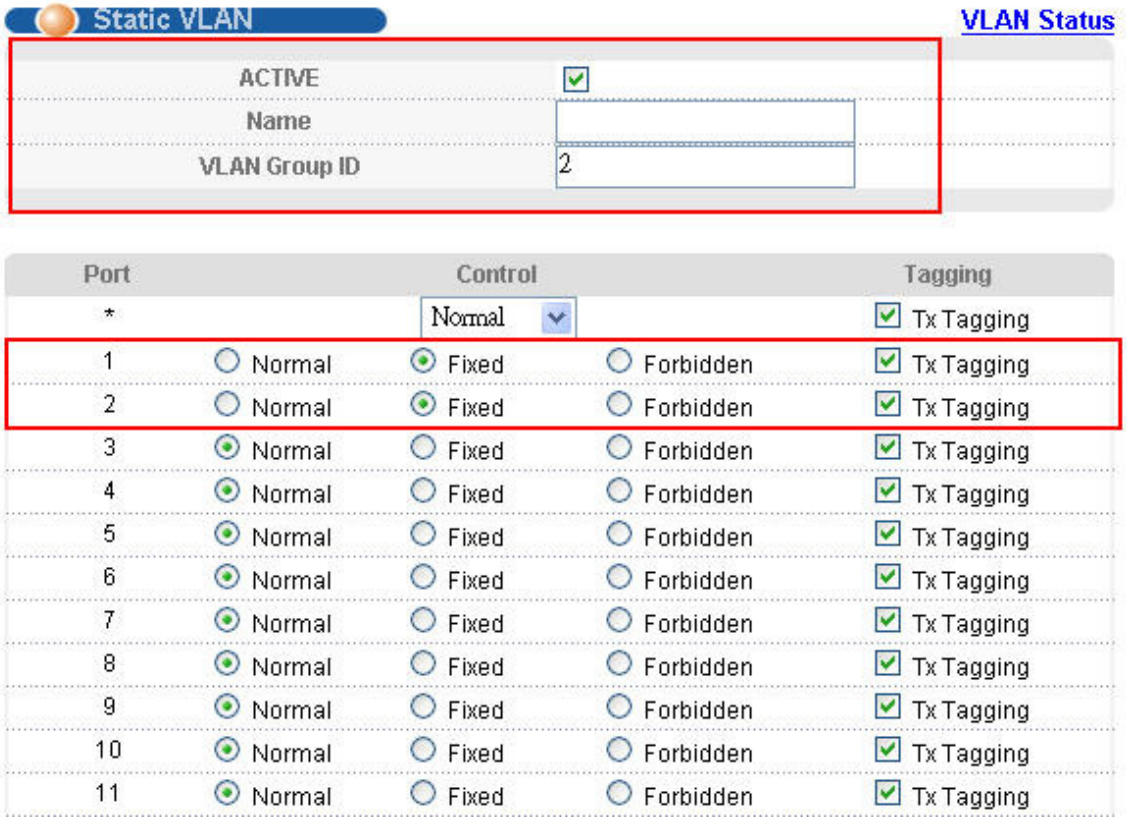

3.)Create vlan 3 for MSTI 2 and click “Add”

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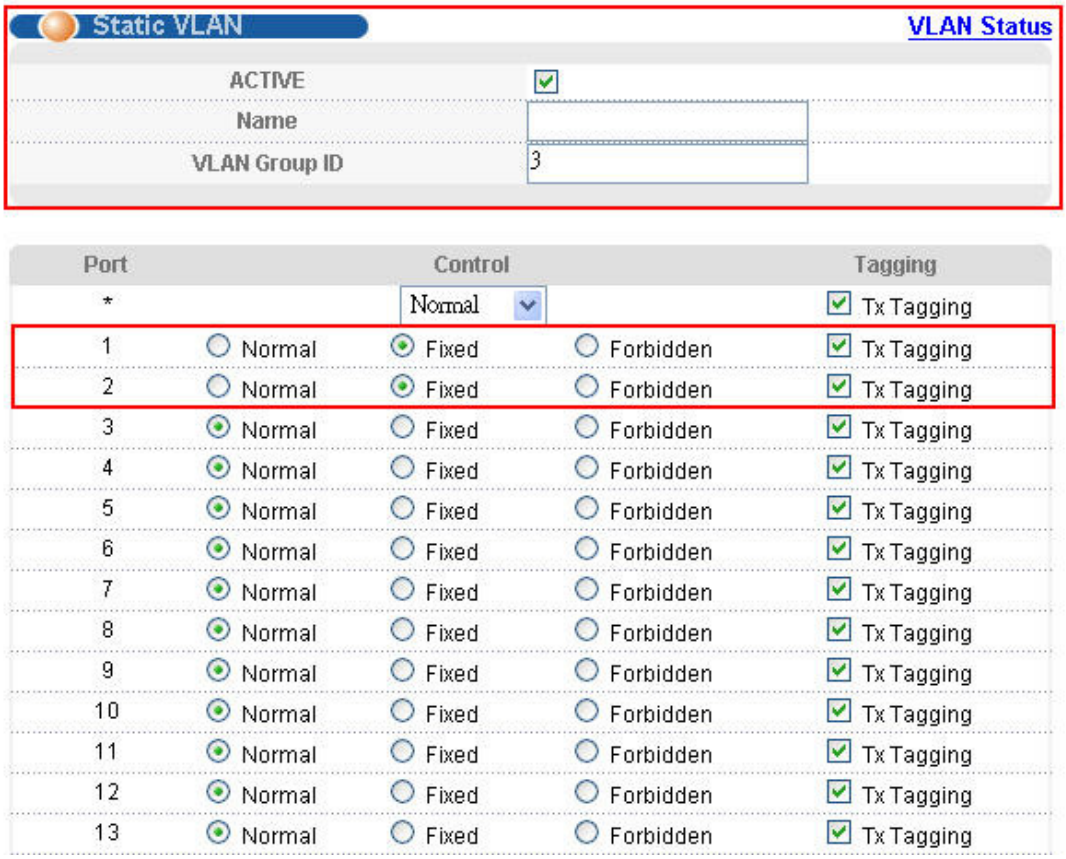

Configuration using the Web GUI – Switch B

1. Connect MGMT port with a PC or Notebook via the RJ45 Cable.
2. By default, the MGMT IP of the out-band port is 192.168.0.1/24
3. Set your NIC to 192.168.0.100/24
4. Open an Internet browser (e.g. IE) and enter http://192.168.0.1 in the URL field.
5. By default, the username for the administrator is “admin” and the corresponding password is “1234”.
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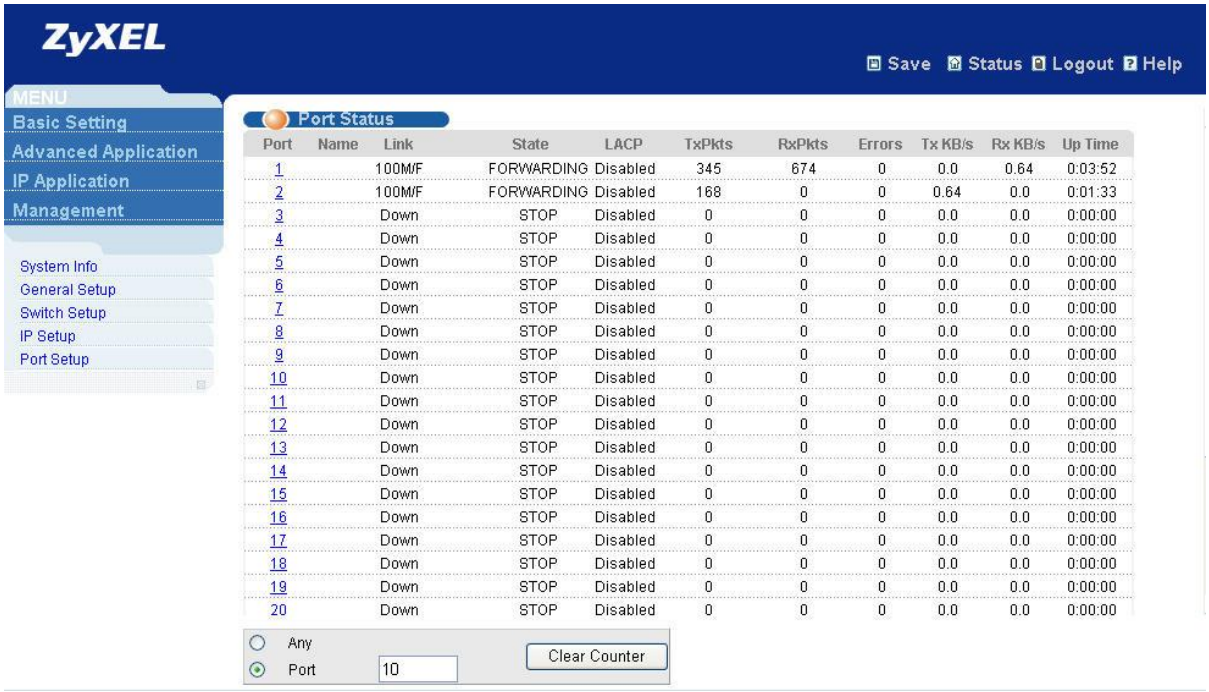

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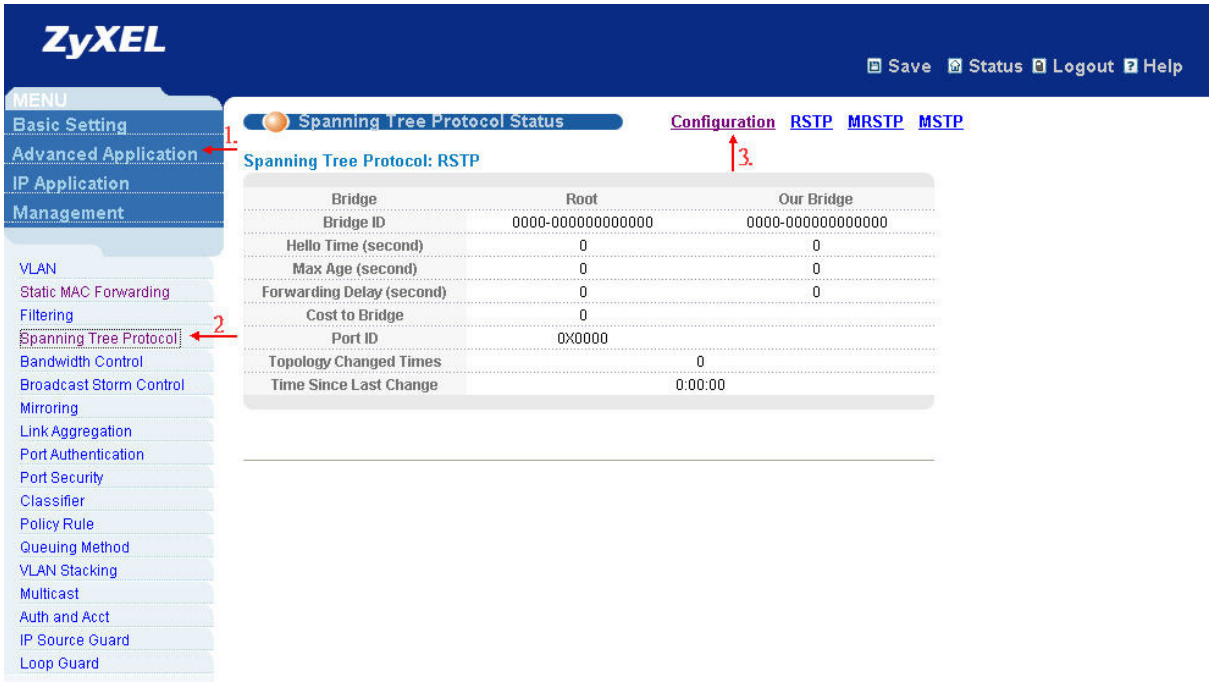

8. After step 7. It will direct you to a "**Spanning Tree Configuration**" page, choose "**Multiple Spanning Tree**" then click the "**Apply**" button.

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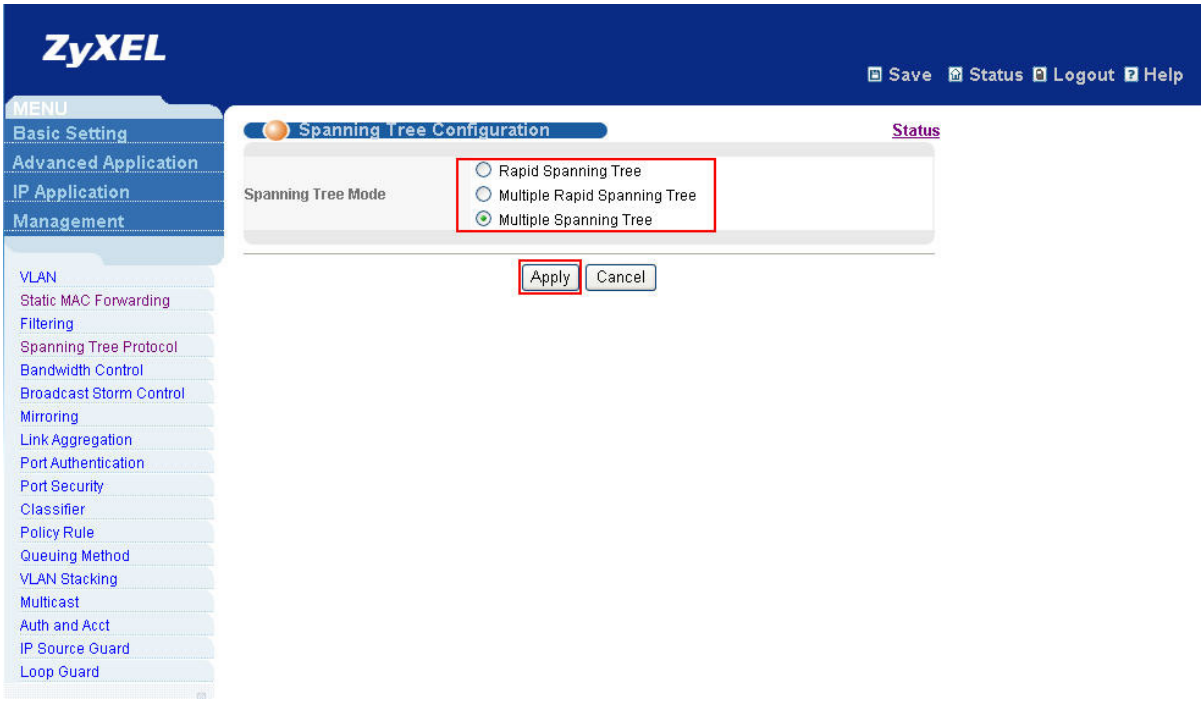
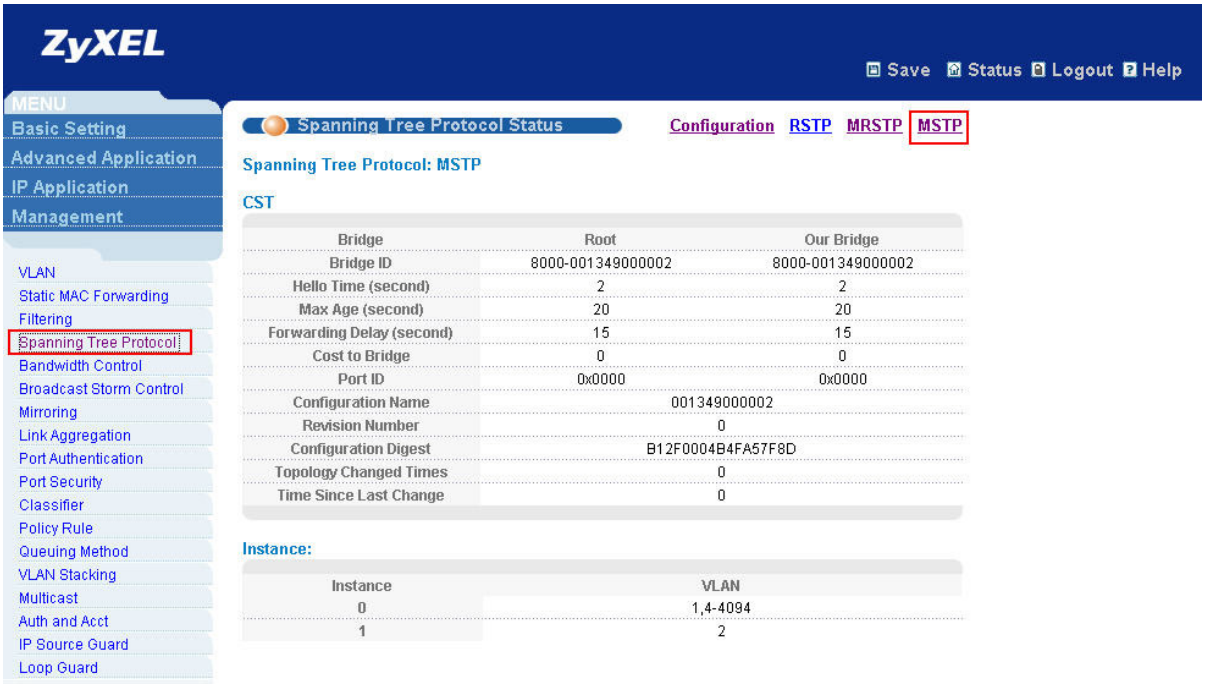


9. Click "**Spanning Tree Protocol**" button and back to "**Spanning Tree Protocol Status**" page. Click "**MSTP"** and go to the "**Multiple Spanning Tree Protocol**" page, you can do detail MSTP configuration from here.



10. At the "Multiple Spanning Tree Protocol" page, create a MSTI 0 setting by following steps. All ports want to join MSTP must be included into MSTI 0.

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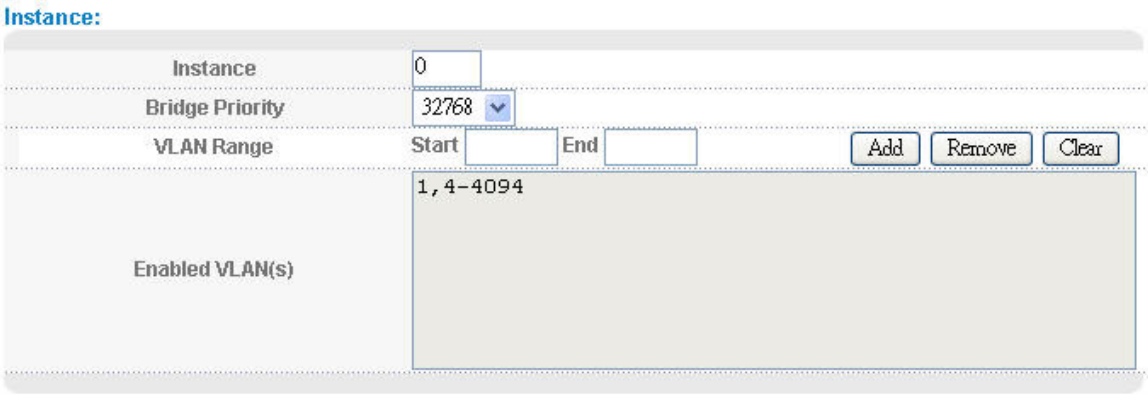
1.Configure the MSTP bridge parameters.(All switches in the same region must have the same “Configuration Name”, “Revision Number” and “vlan-MSTI mapping”.)

1.) Check “Active”
2.) Configure the “Hello Time”
3.) Configure the “Max Age” time
4.) Configure the “Forwarding Delay” time
5.) Configure the “Max hops”
6.) Configure the “Configuration Name”
7.) Configure the “Revision Number”
8.) Click “Apply” buttom

2.Configure the MSTI parameters and choose which vlan should join this MSTI and click “Add”



3.Choose which port should be included in this MSTI. Click “Add”

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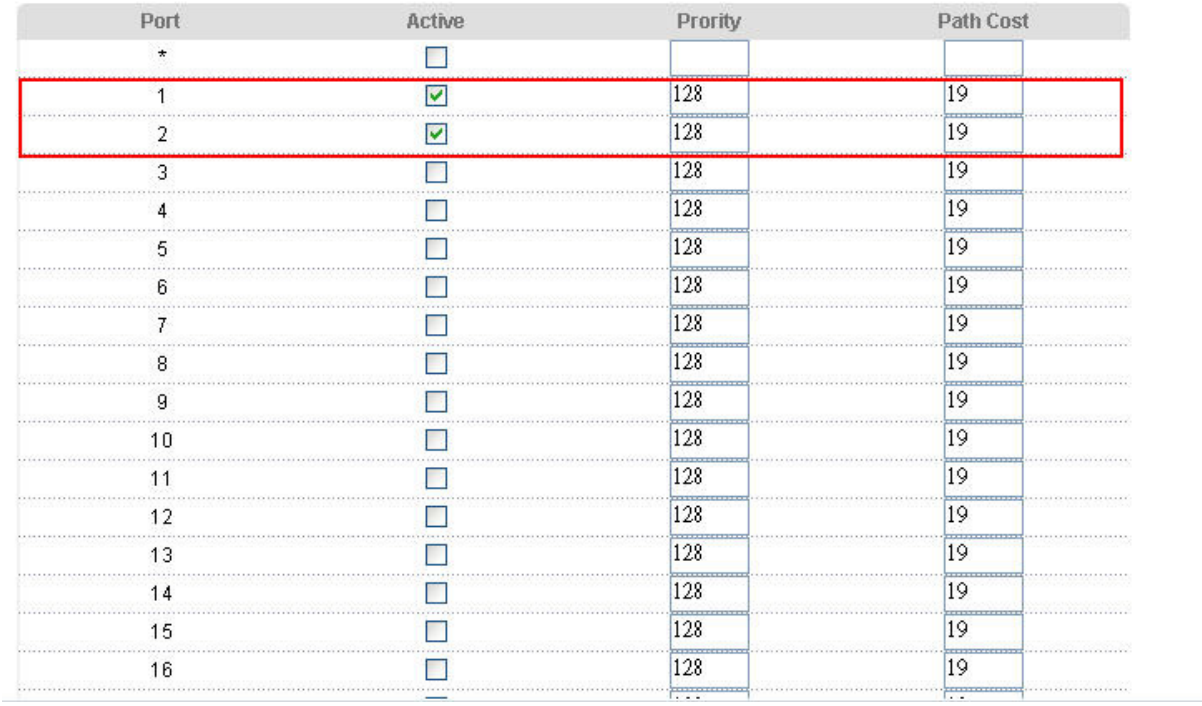

Port	Active	Prority	Path Cost
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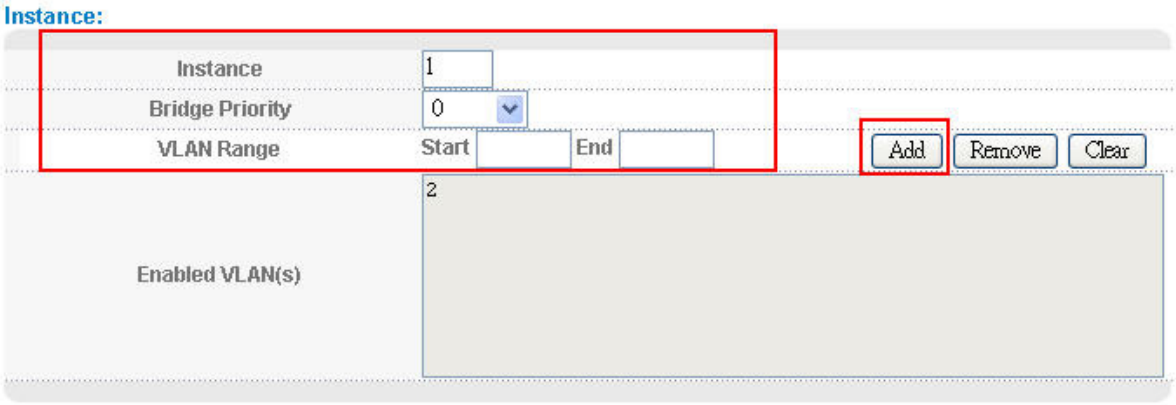
8	☐	128	19
9	☐	128	19
10	☐	128	19
11	☐	128	19
12	☐	128	19
13	☐	128	19
14	☐	128	19
15	☐	128	19
16	☐	128	19

11. At the “Multiple Spanning Tree Protocol” page, create a MSTI 1 setting by following steps.

1.Configure the MSTI parameters and choose which vlan should join this MSTI and click “Add”. Because Switch B is the root of MSTI 1, we need to configure the “Bridge Priority” of this instance to “0”



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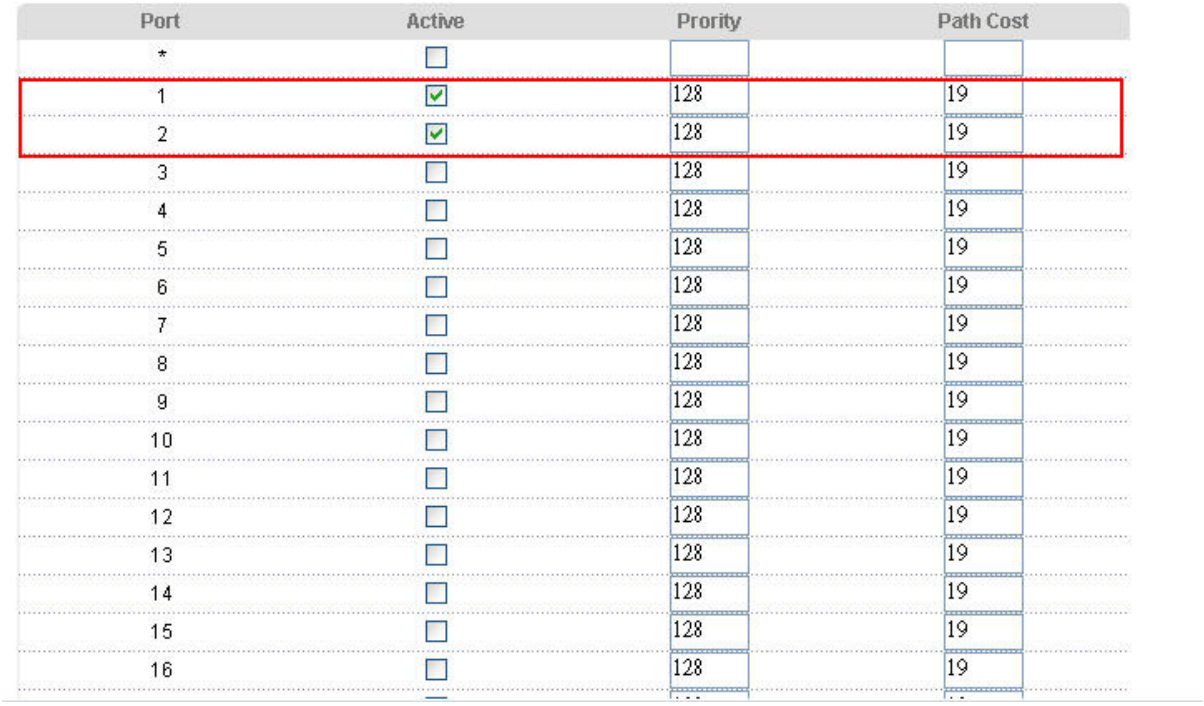

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9	☐	128	19
10	☐	128	19
11	☐	128	19
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15	☐	128	19
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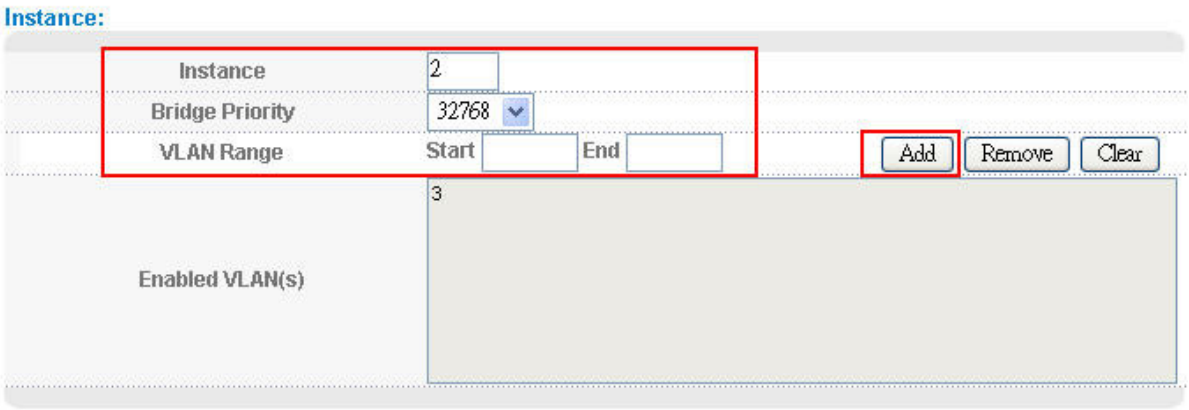
1.Configure the MSTI parameters and choose which vlan should join this MSTI and click “Add”



2.Choose which port should be included in this MSTI. Click “Add”

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4	☐	128	19
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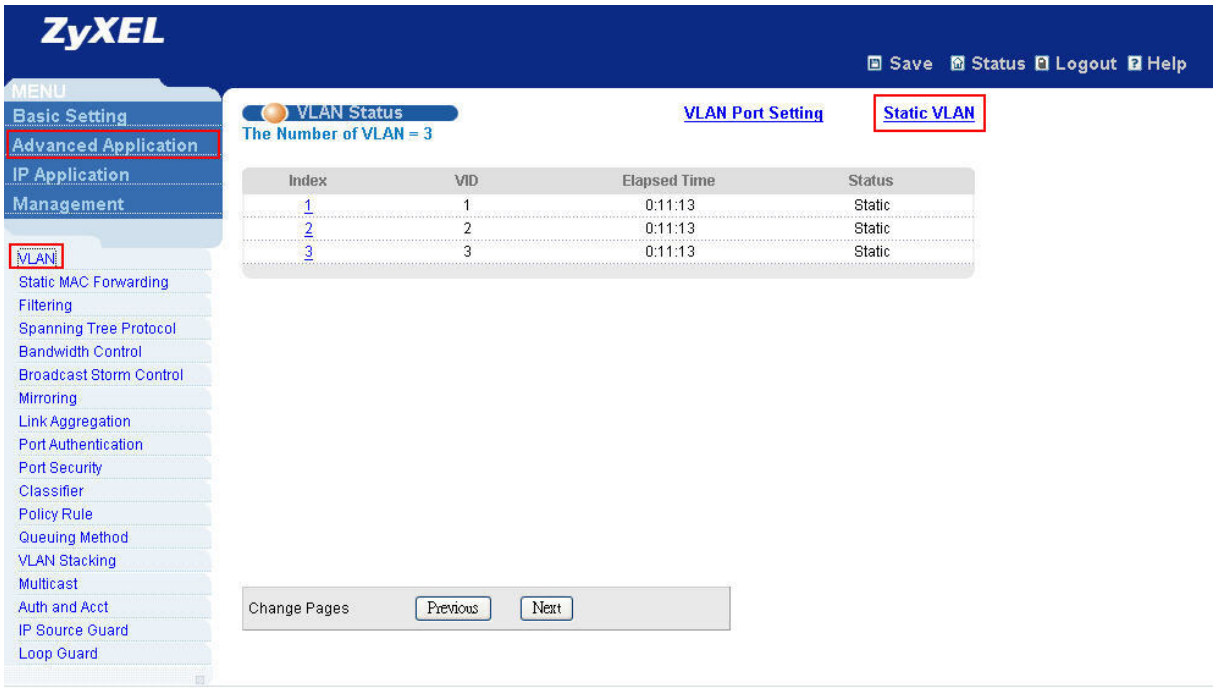
1.)Go to “Static VLAN” page by clicking “Advanced Application” ”VLAN” “Static VLAN”



2.)Create vlan 2 for MSTI 1 and click “Add”

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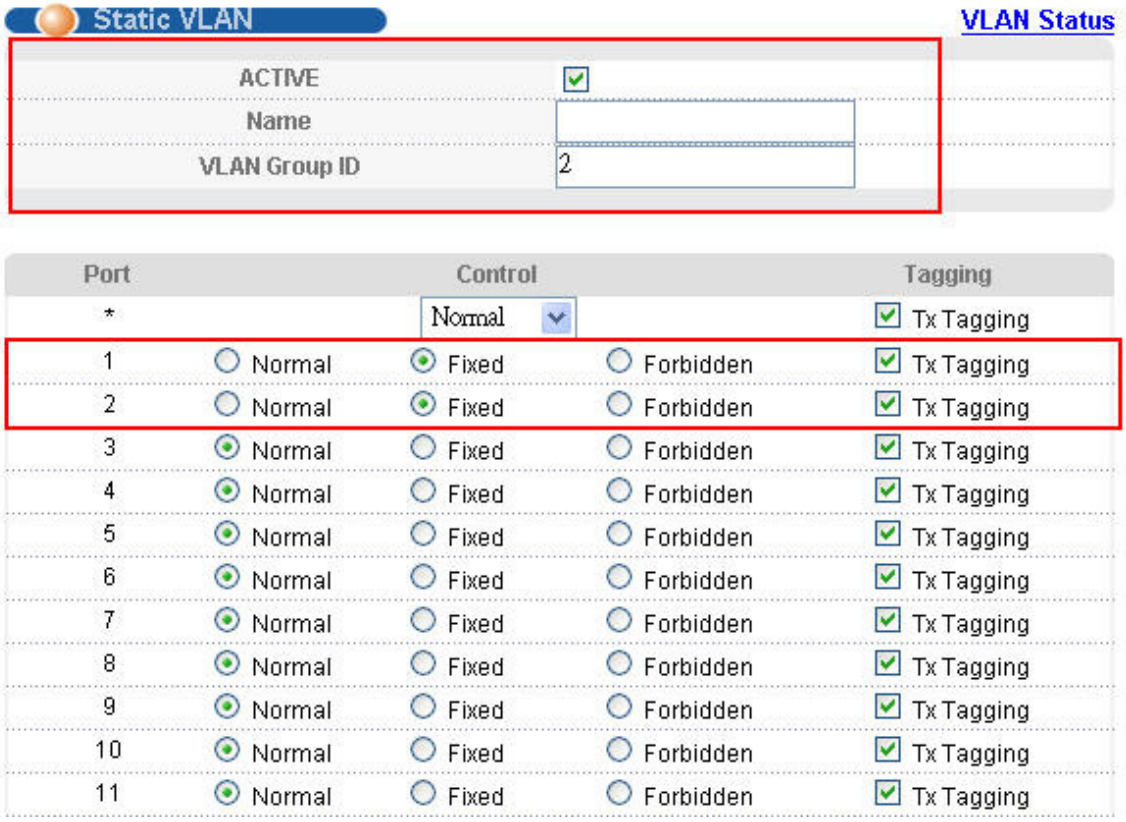

3.)Create vlan 3 for MSTI 2 and click “Add”

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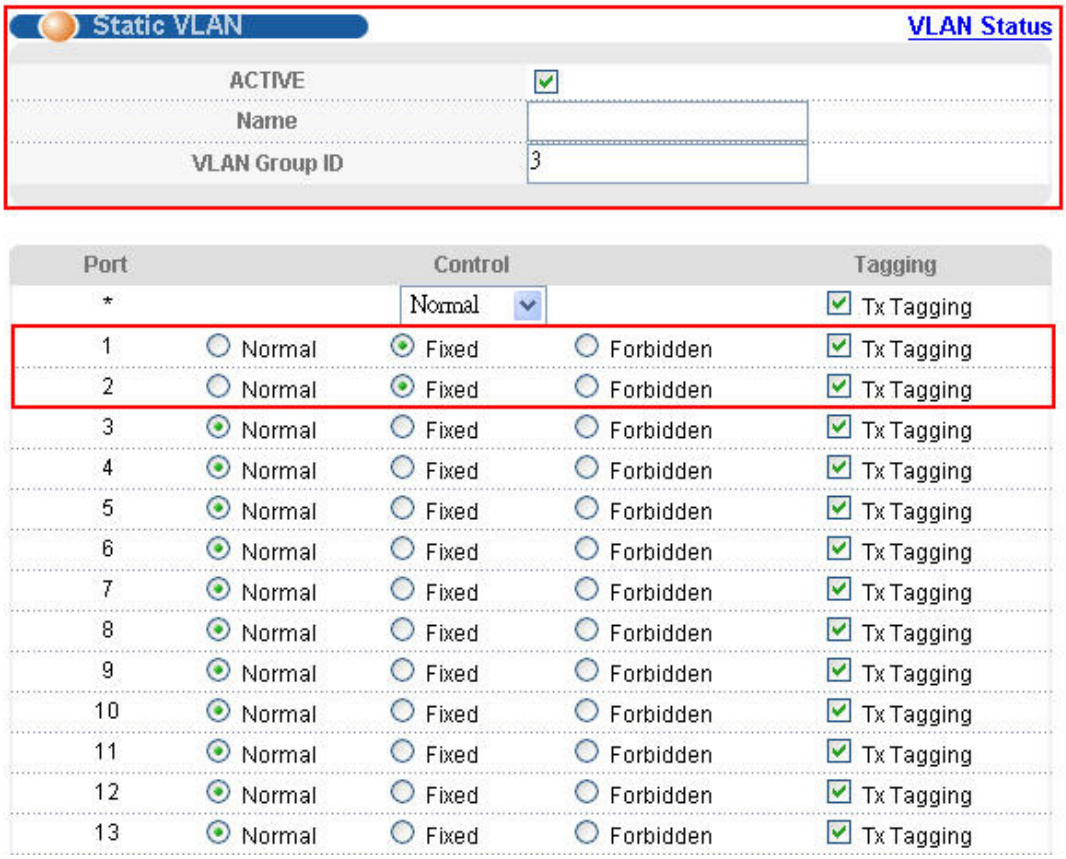

Configuration using the Web GUI – Switch C

1. Connect MGMT port with a PC or Notebook via the RJ45 Cable.
2. By default, the MGMT IP of the out-band port is 192.168.0.1/24
3. Set your NIC to 192.168.0.100/24
4. Open an Internet browser (e.g. IE) and enter http://192.168.0.1 in the URL field.
5. By default, the username for the administrator is “admin” and the corresponding password is “1234”.
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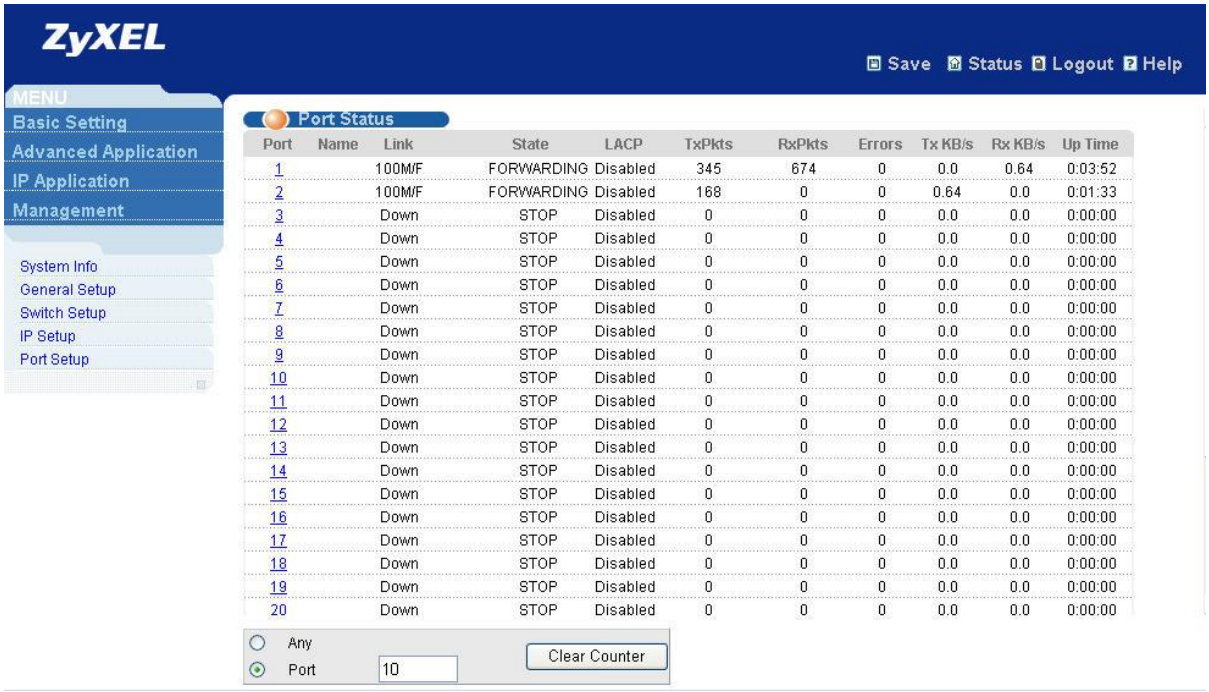

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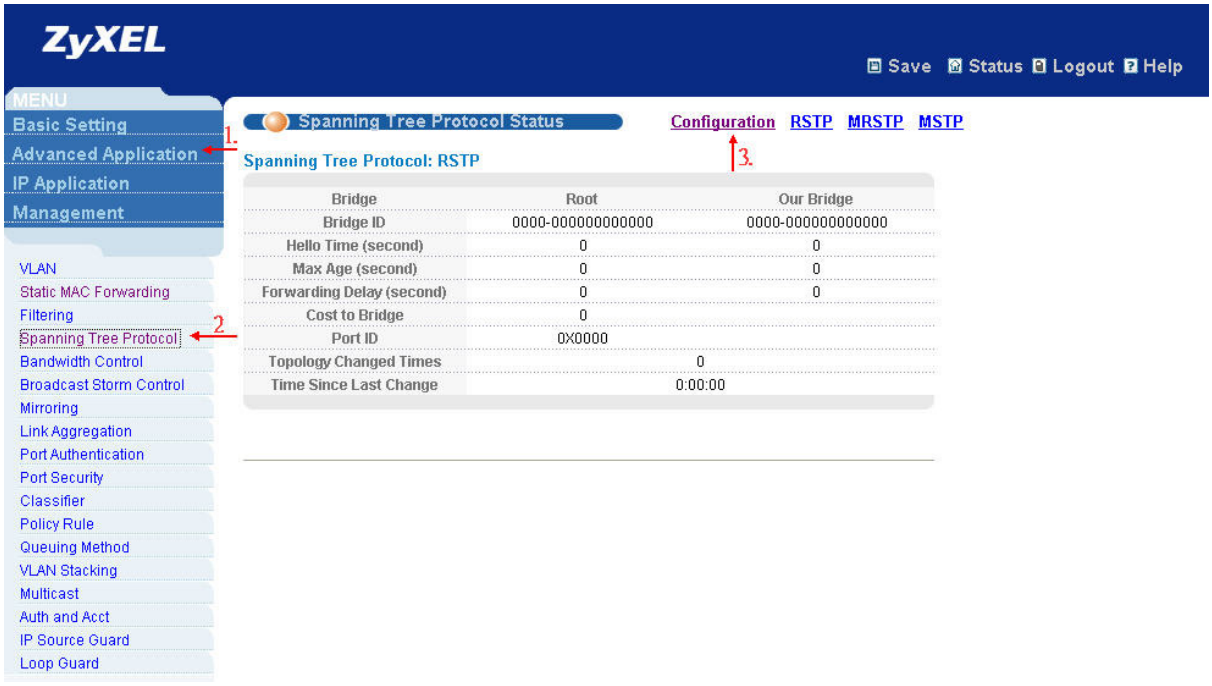

8. After step 7. It will direct you to a "**Spanning Tree Configuration**" page, choose "**Multiple Spanning Tree**" then click the "**Apply**" button.

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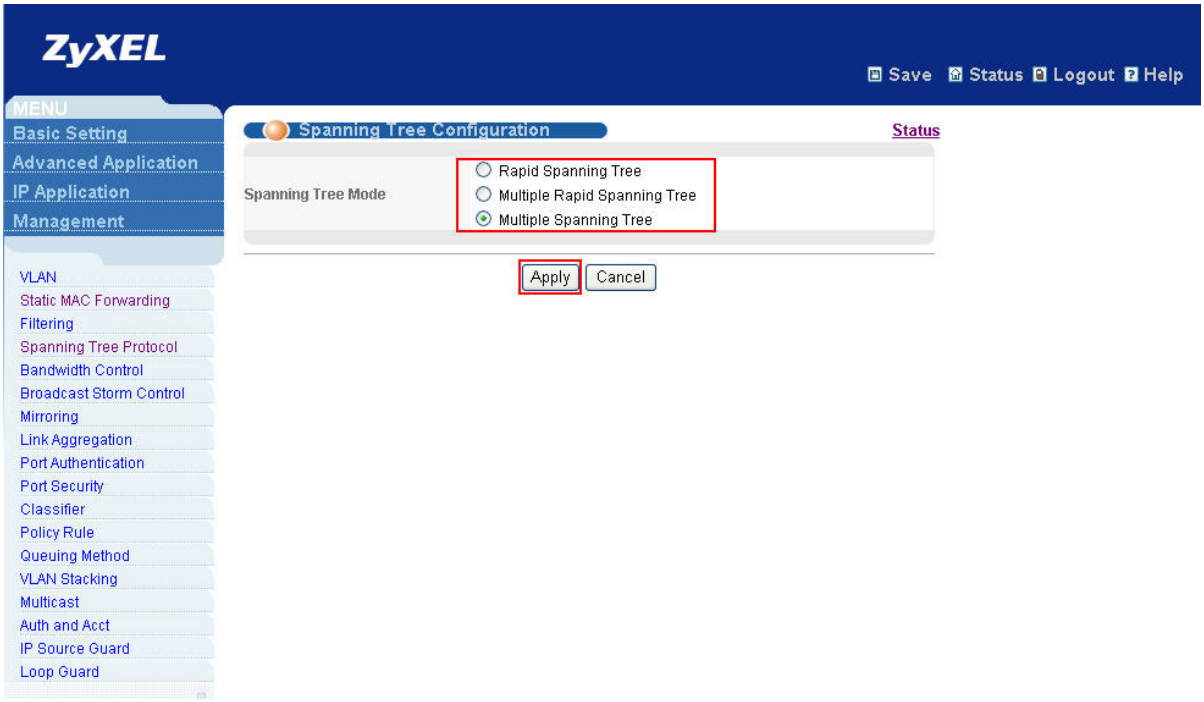
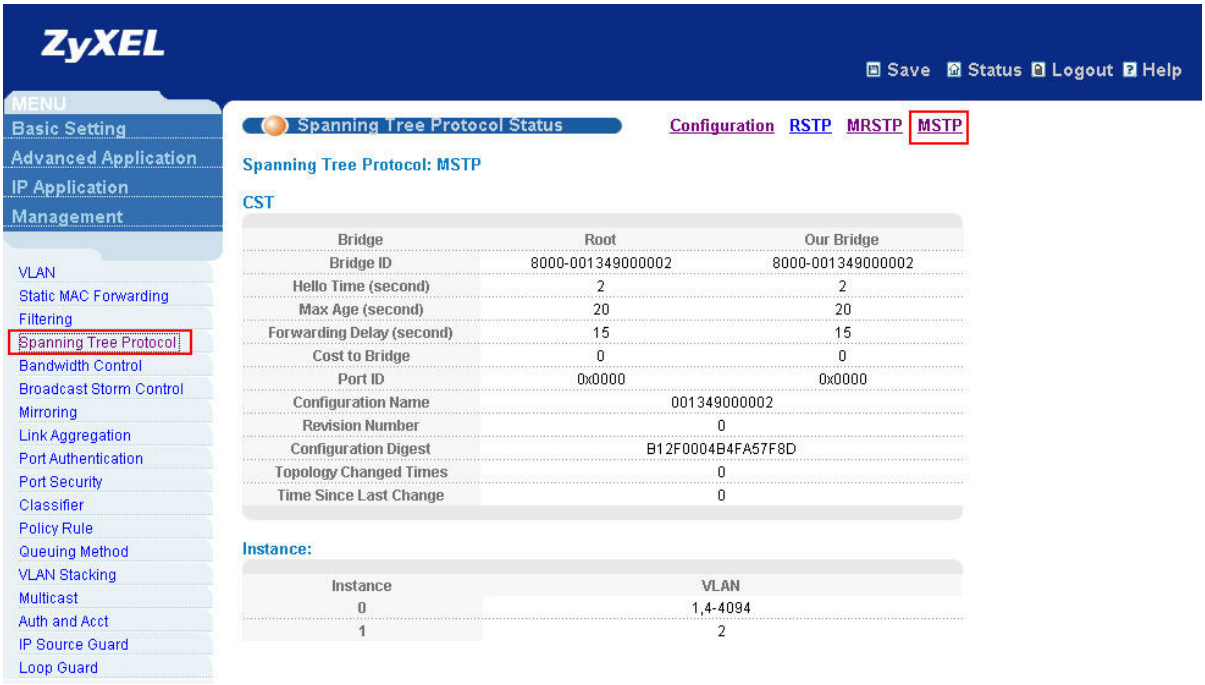


9. Click "**Spanning Tree Protocol**" button and back to "**Spanning Tree Protocol Status**" page. Click "**MSTP"** and go to the "**Multiple Spanning Tree Protocol**" page, you can do detail MSTP configuration from here.



10. At the "Multiple Spanning Tree Protocol" page, create a MSTI 0 setting by following steps. All ports want to join MSTP must be included into MSTI 0.

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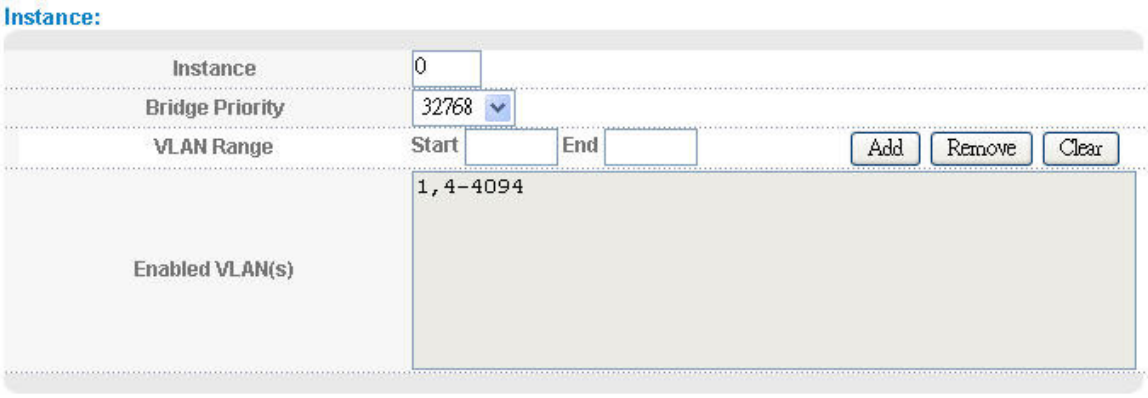
1.Configure the MSTP bridge parameters.(All switches in the same region must have the same “Configuration Name”, “Revision Number” and “vlan-MSTI mapping”.)

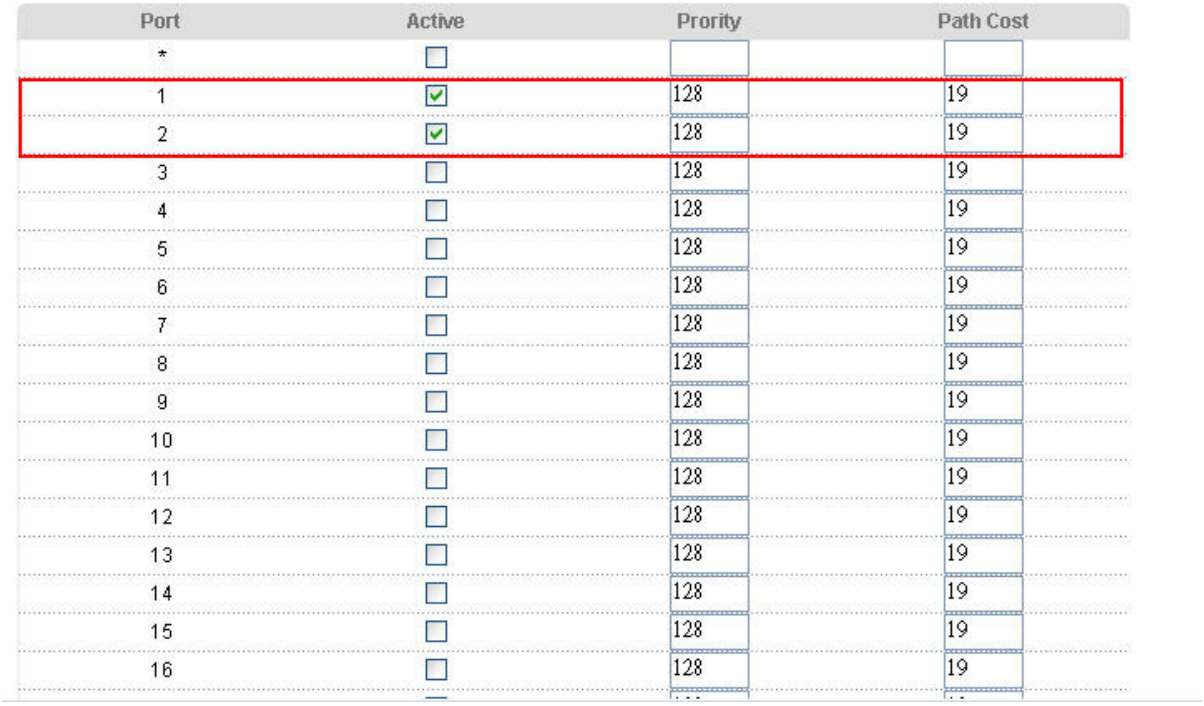
1.) Check “Active”
2.) Configure the “Hello Time”
3.) Configure the “Max Age” time
4.) Configure the “Forwarding Delay” time
5.) Configure the “Max hops”
6.) Configure the “Configuration Name”
7.) Configure the “Revision Number”
8.) Click “Apply” buttom

2.Configure the MSTI parameters and choose which vlan should join this MSTI and click “Add”



3.Choose which port should be included in this MSTI. Click “Add”

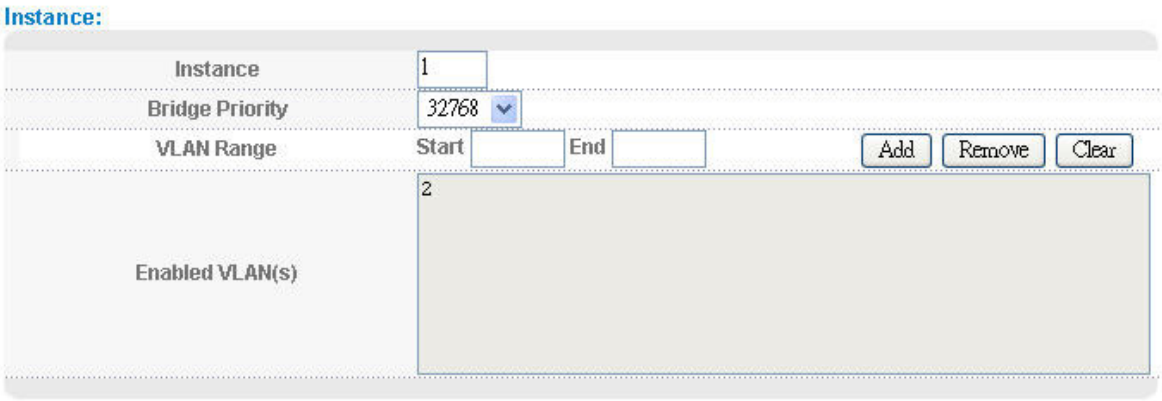
All contents copyright (c) 2011 ZyXEL Communications Corporation.



Port	Active	Prority	Path Cost
*	☐		
1	☑	128	19
2	☑	128	19
3	☐	128	19
4	☐	128	19
5	☐	128	19
6	☐	128	19
7	☐	128	19
8	☐	128	19
9	☐	128	19
10	☐	128	19
11	☐	128	19
12	☐	128	19
13	☐	128	19
14	☐	128	19
15	☐	128	19
16	☐	128	19

11. At the “Multiple Spanning Tree Protocol” page, create a MSTI 1 setting by following steps.

1.Configure the MSTI parameters and choose which vlan should join this MSTI and click “Add”.



2.Choose which port should be included in this MSTI. Click “Add”

All contents copyright (c) 2011 ZyXEL Communications Corporation.

Port	Active	Prority	Path Cost
*	☐		
1	☑	128	19
2	☑	128	19
3	☐	128	19
4	☐	128	19
5	☐	128	19
6	☐	128	19
7	☐	128	19
8	☐	128	19
9	☐	128	19
10	☐	128	19
11	☐	128	19
12	☐	128	19
13	☐	128	19
14	☐	128	19
15	☐	128	19
16	☐	128	19

12. At the “Multiple Spanning Tree Protocol” page, create a MSTI 1 setting by following steps.

1.Configure the MSTI parameters and choose which vlan should join this MSTI and click “Add”. Because Switch C is the root of MSTI 2, we need to configure the “Bridge Priority” of this instance to “0”

Instance:

Instance	2					
Bridge Priority	0					
VLAN Range	Start		End		Add	Remove	Clear
Enabled VLAN(s)	3					

2.Choose which port should be included in this MSTI. Click “Add”

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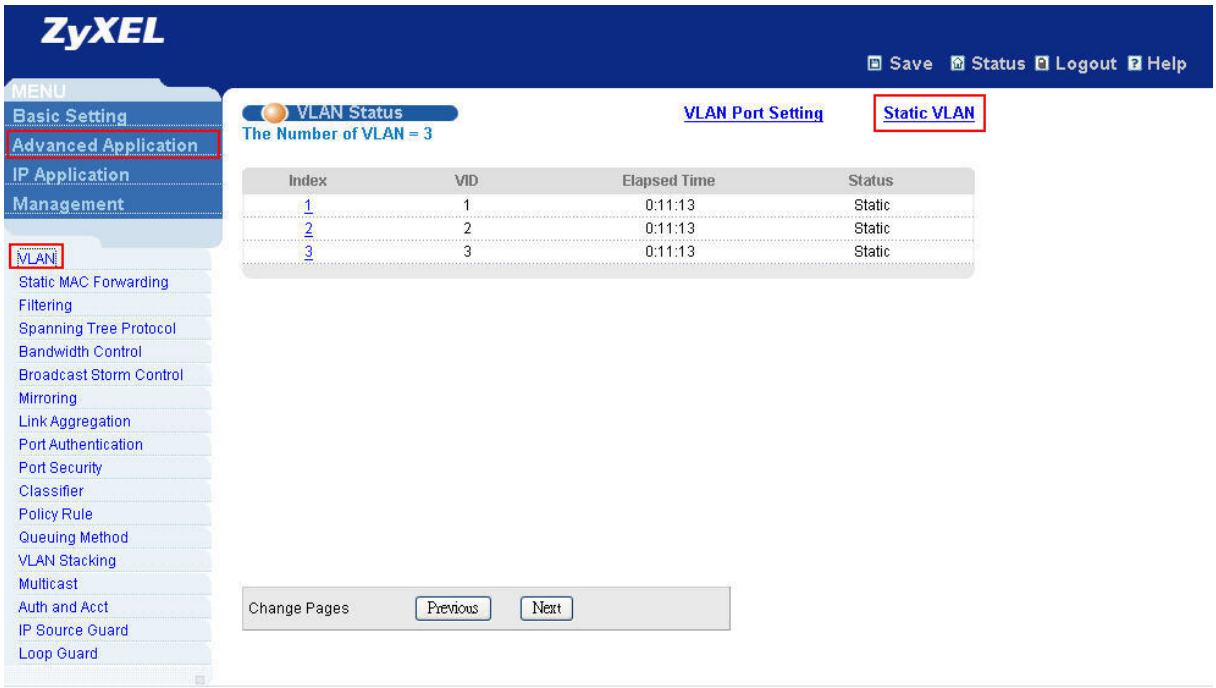
Port	Active	Prority	Path Cost
*	☐		
1	☑	128	19
2	☑	128	19
3	☐	128	19
4	☐	128	19
5	☐	128	19
6	☐	128	19
7	☐	128	19
8	☐	128	19
9	☐	128	19
10	☐	128	19
11	☐	128	19
12	☐	128	19
13	☐	128	19
14	☐	128	19
15	☐	128	19
16	☐	128	19

13. Create vlans corresponding to MST instances.

1.)Go to “Static VLAN” page by clicking “Advanced Application” ”VLAN” “Static VLAN”



2.)Create vlan 2 for MSTI 1 and click “Add”

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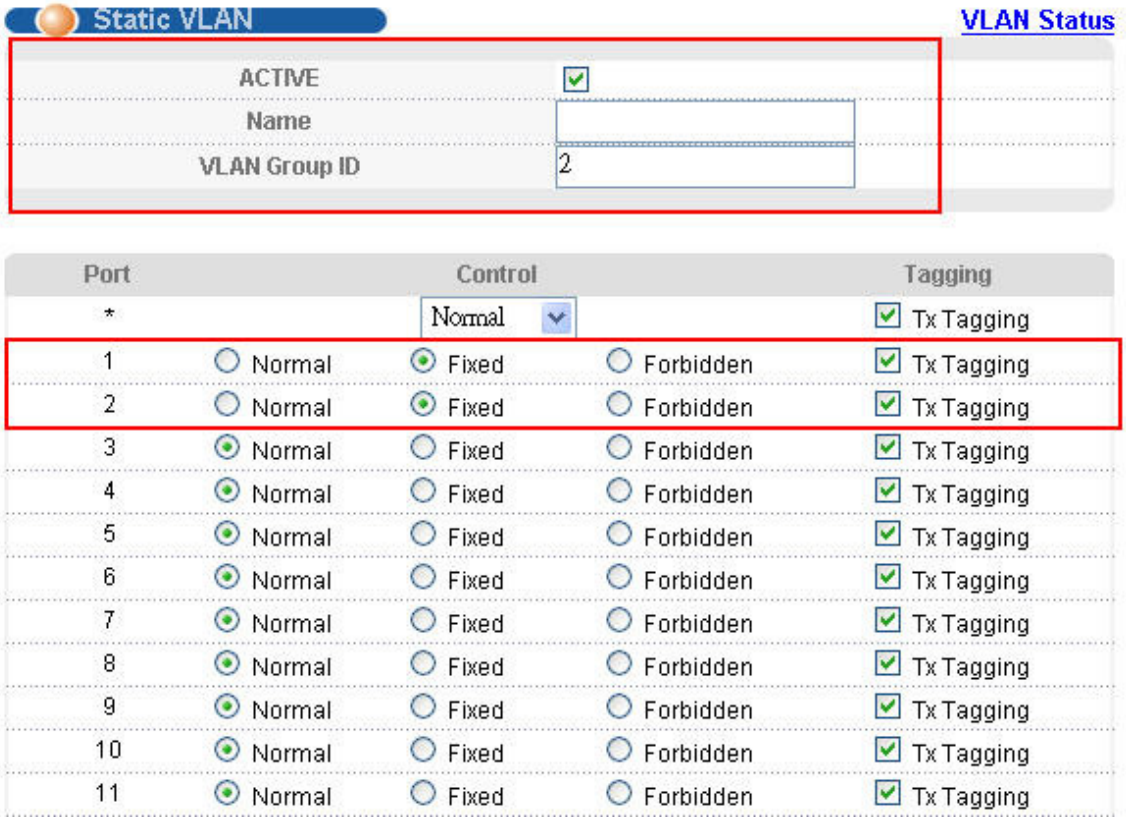

3.)Create vlan 3 for MSTI 2 and click “Add”

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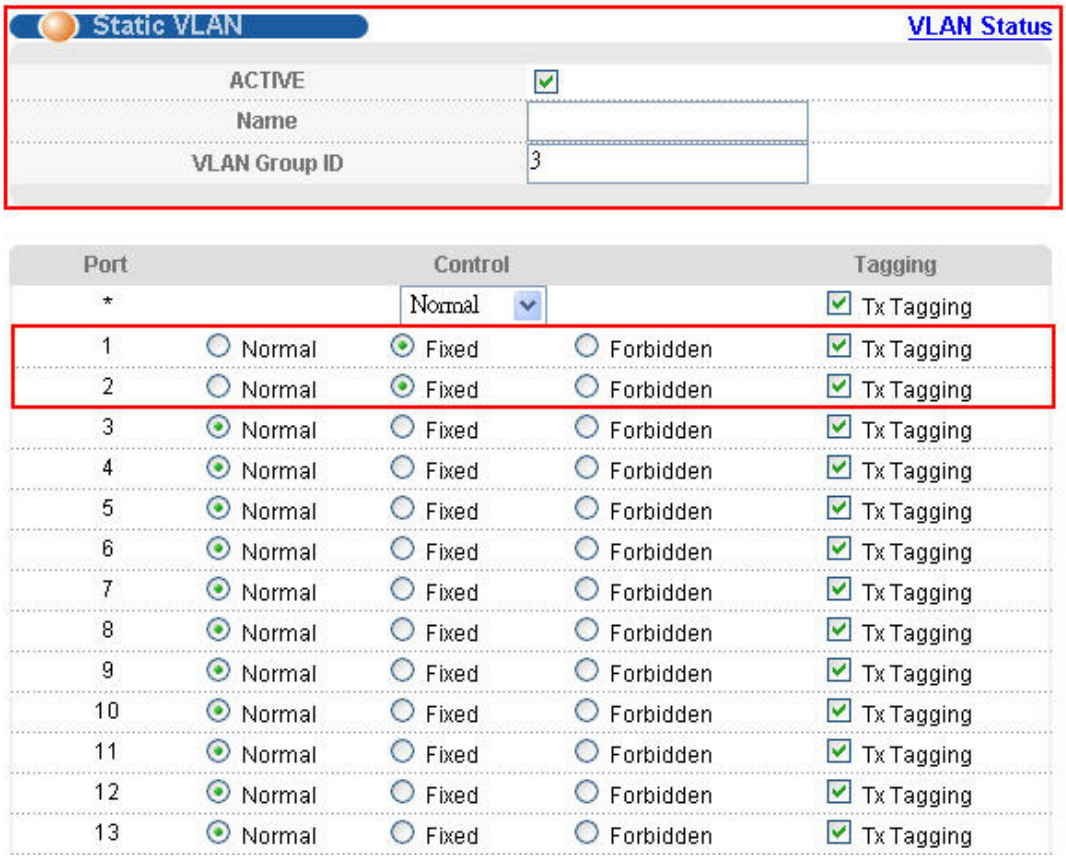

Configuration using the Web GUI – Switch D

1. Connect MGMT port with a PC or Notebook via the RJ45 Cable.
2. By default, the MGMT IP of the out-band port is 192.168.0.1/24
3. Set your NIC to 192.168.0.100/24
4. Open an Internet browser (e.g. IE) and enter http://192.168.0.1 in the URL field.
5. By default, the username for the administrator is “admin” and the corresponding password is “1234”.
6. After successful login you will see a screen similar to the one on the screenshot below.

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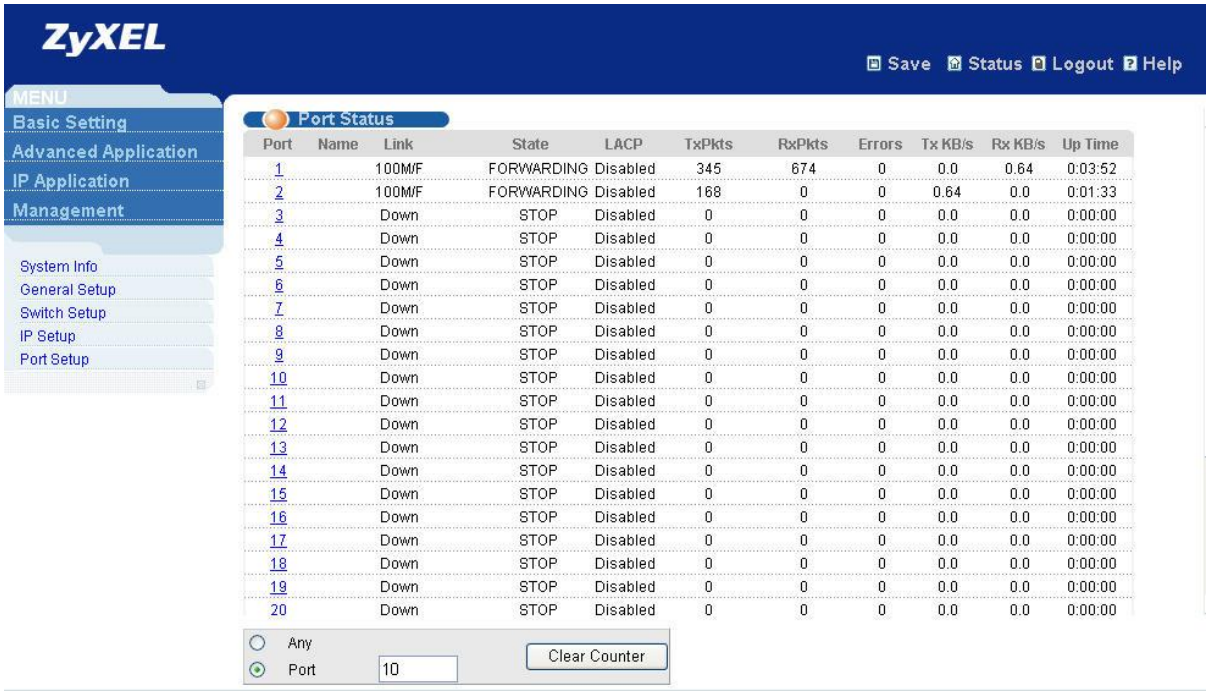
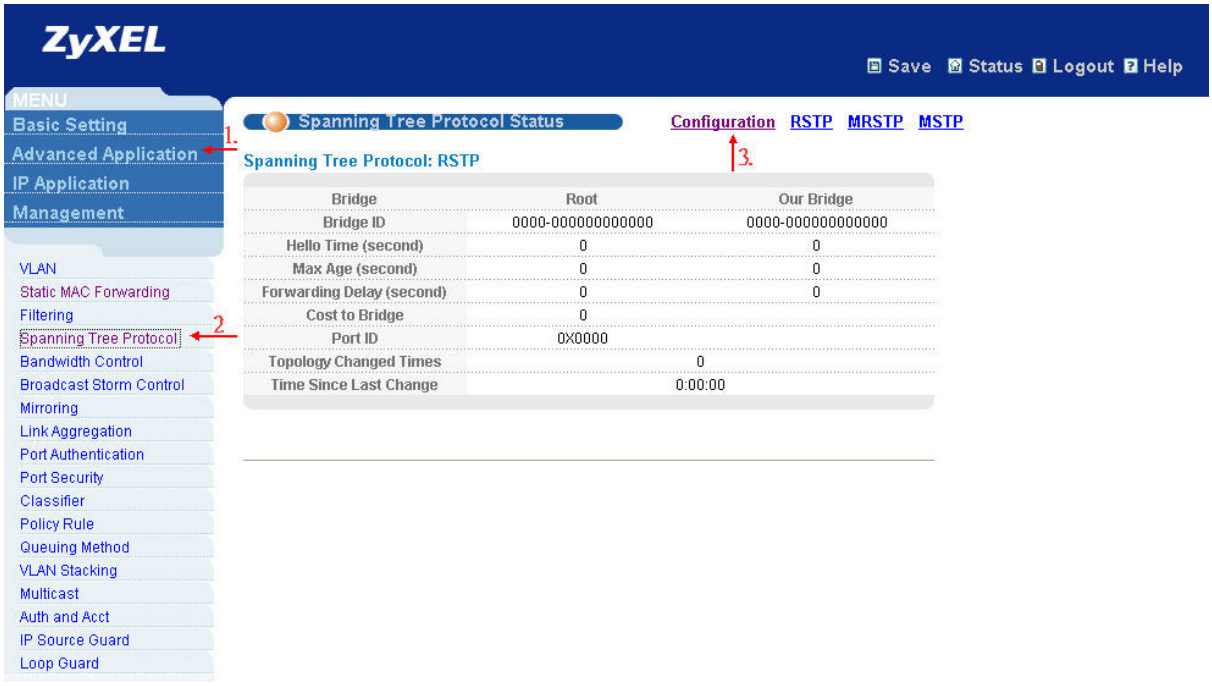


7. First of all, you need to enable the switch's MSTP function. To do so, click items depicted below. **Advanced Application -> Spanning Tree Protocol -> Configuration**



8. After step 7. It will direct you to a "**Spanning Tree Configuration**" page, choose "**Multiple Spanning Tree**" then click the "**Apply**" button.

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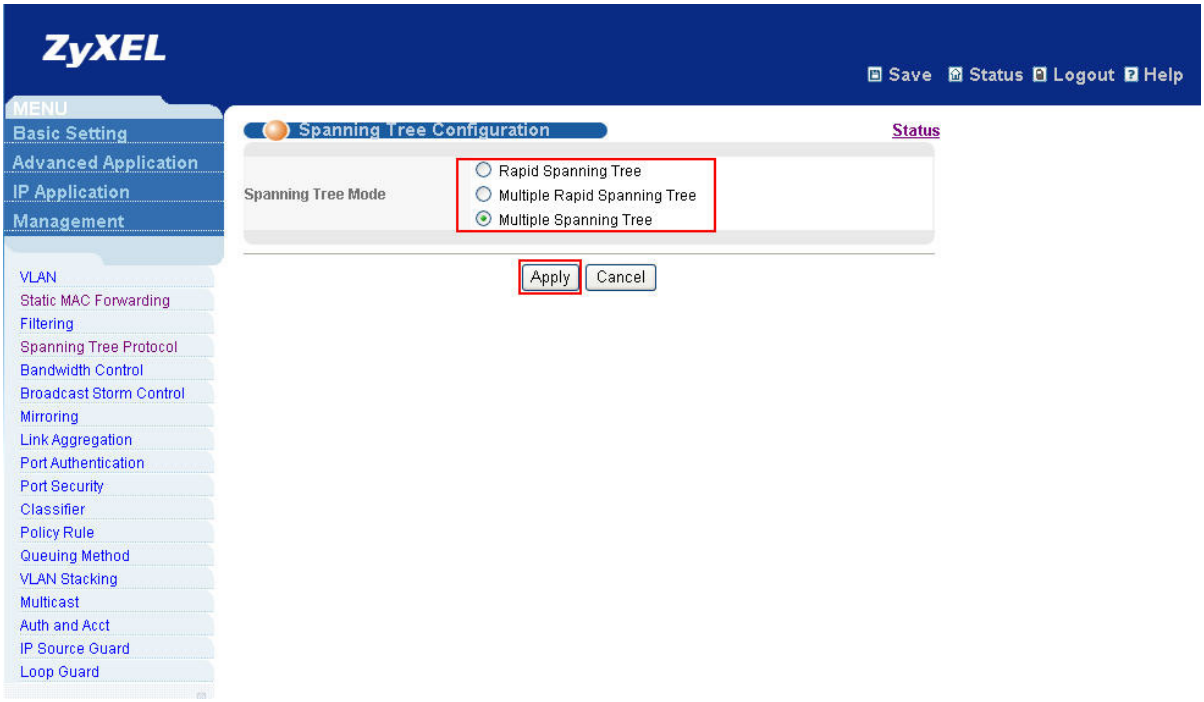
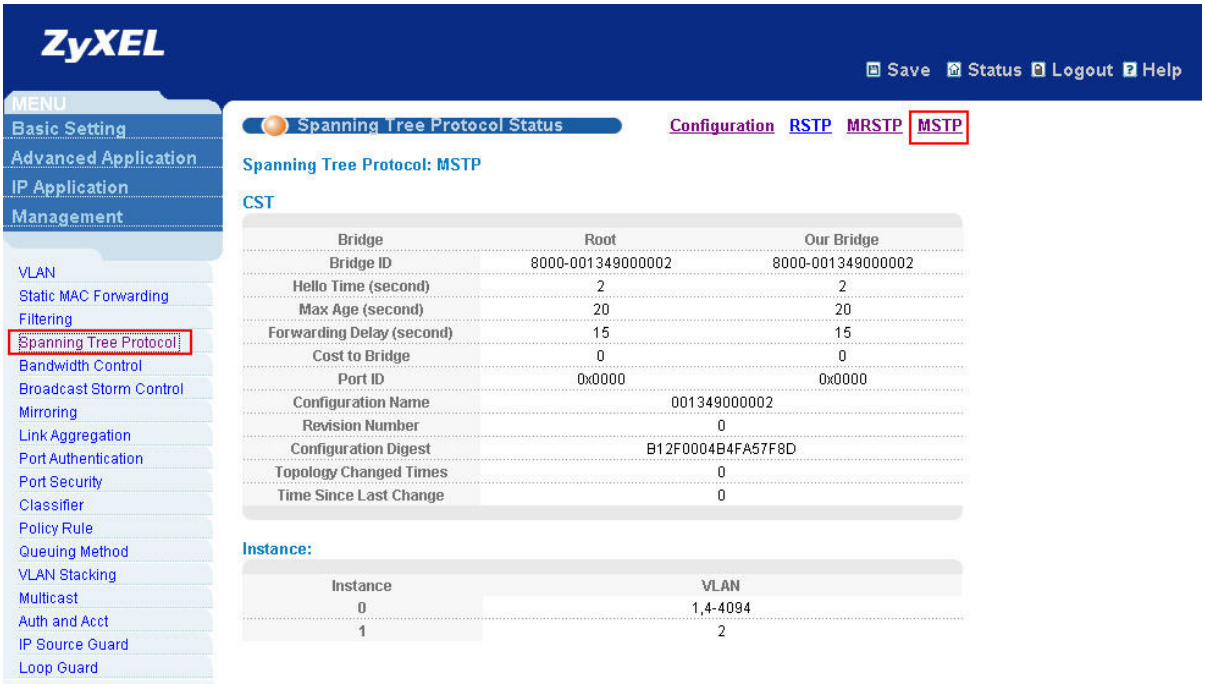


9. Click "**Spanning Tree Protocol**" button and back to "**Spanning Tree Protocol Status**" page. Click "**MSTP"** and go to the "**Multiple Spanning Tree Protocol**" page, you can do detail MSTP configuration from here.



10. At the "Multiple Spanning Tree Protocol" page, create a MSTI 0 setting by following steps. All ports want to join MSTP must be included into MSTI 0

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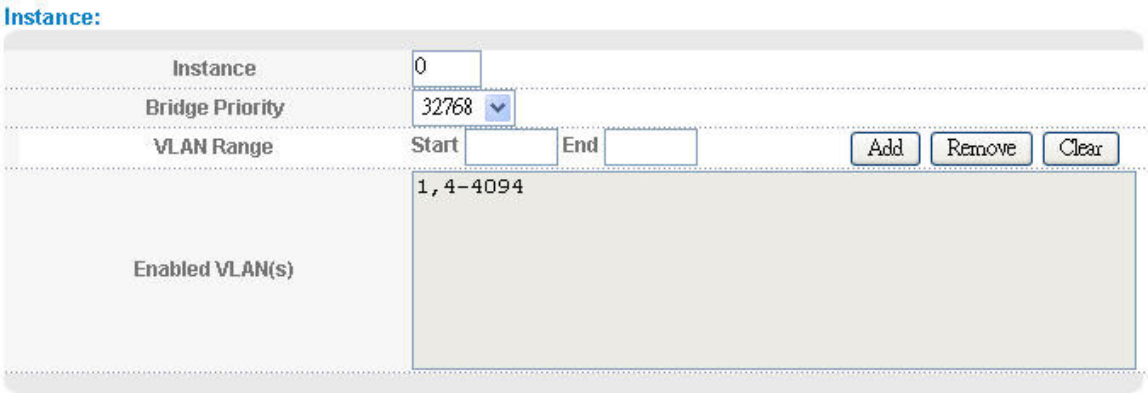
1.Configure the MSTP bridge parameters. (All switches in the same region must have the same “Configuration Name”, “Revision Number” and “vlan-MSTI mapping”.)

1.) Check “Active”
2.) Configure the “Hello Time”
3.) Configure the “Max Age” time
4.) Configure the “Forwarding Delay” time
5.) Configure the “Max hops”
6.) Configure the “Configuration Name”
7.) Configure the “Revision Number”
8.) Click “Apply” buttom

2.Configure the MSTI parameters and choose which vlan should join this MSTI and click “Add”



3.Choose which port should be included in this MSTI. Click “Add”

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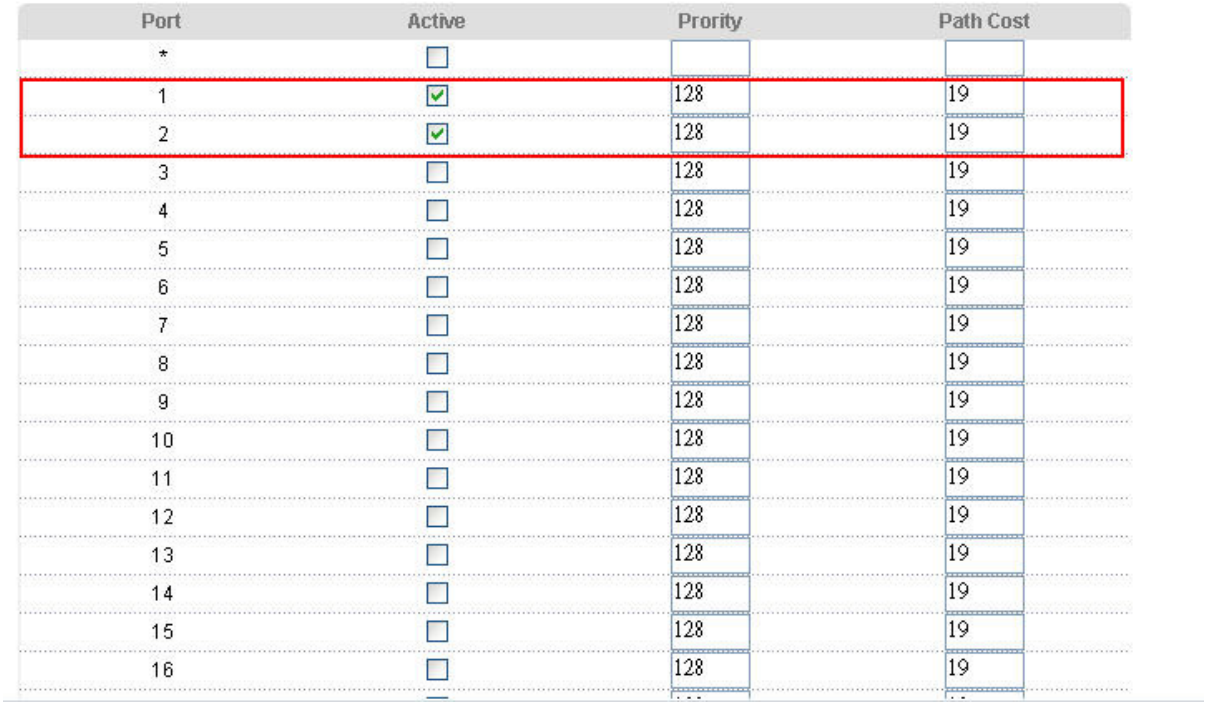
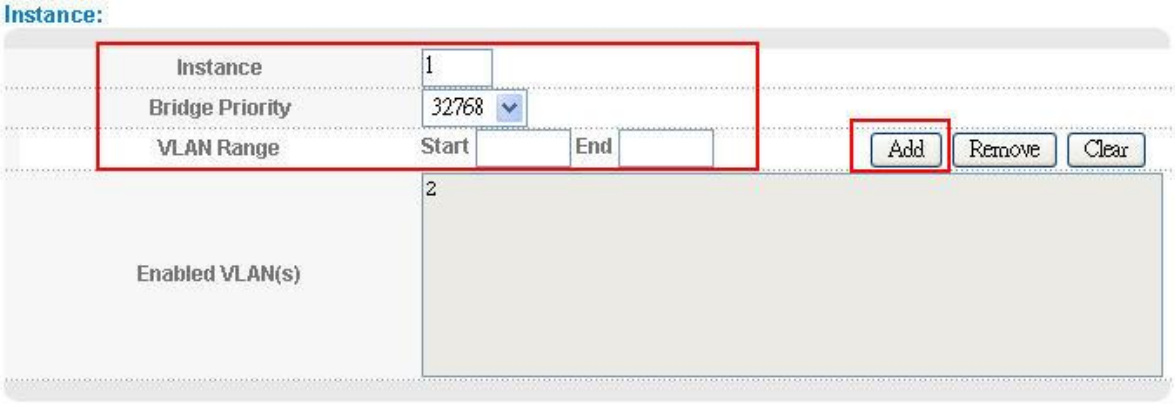


Port	Active	Prority	Path Cost
*	☐		
1	☑	128	19
2	☑	128	19
3	☐	128	19
4	☐	128	19
5	☐	128	19
6	☐	128	19
7	☐	128	19
8	☐	128	19
9	☐	128	19
10	☐	128	19
11	☐	128	19
12	☐	128	19
13	☐	128	19
14	☐	128	19
15	☐	128	19
16	☐	128	19

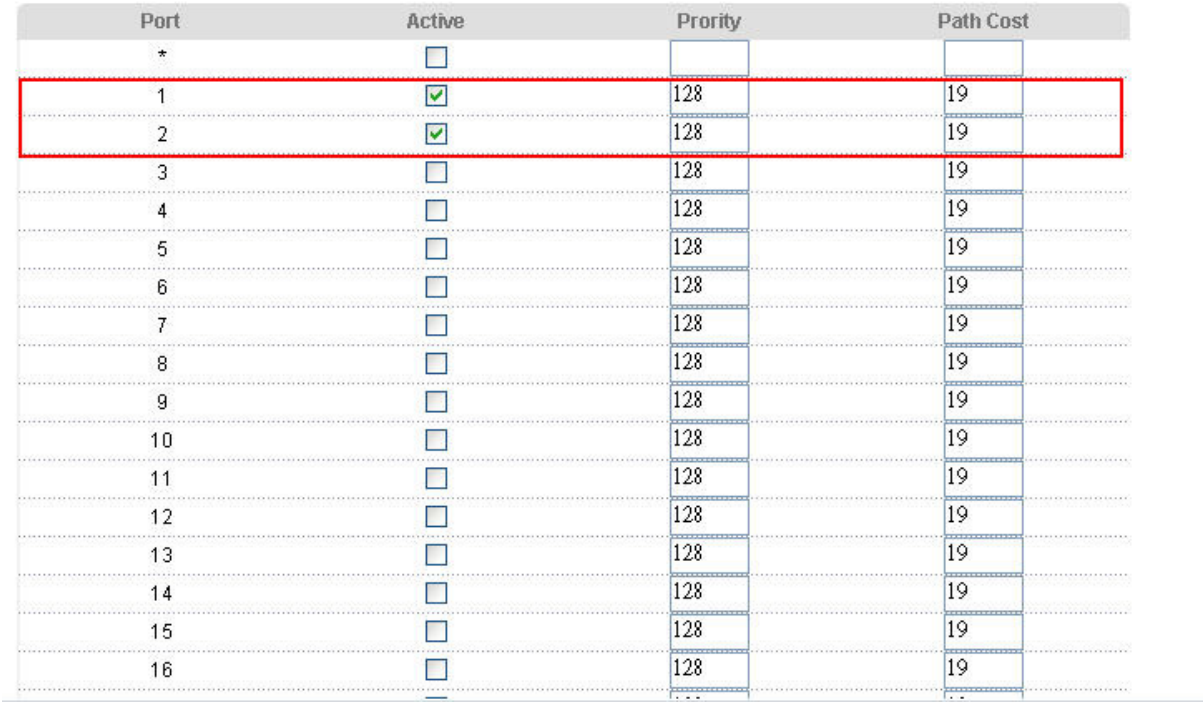
11. At the “Multiple Spanning Tree Protocol” page, create a MSTI 1 setting by following steps.

1.Configure the MSTI parameters and choose which vlan should join this MSTI and click “Add”



2.Choose which port should be included in this MSTI. Click “Add”

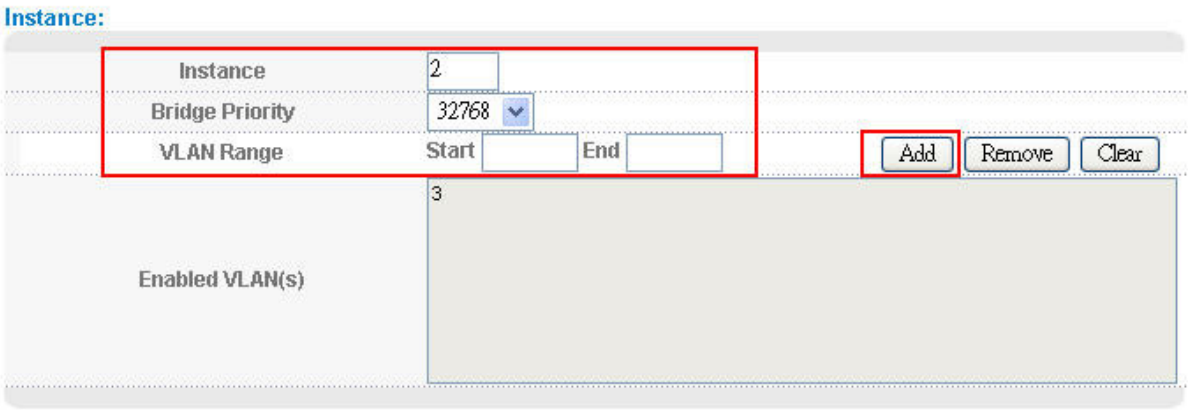
All contents copyright (c) 2011 ZyXEL Communications Corporation.



Port	Active	Prority	Path Cost
*	☐		
1	☑	128	19
2	☑	128	19
3	☐	128	19
4	☐	128	19
5	☐	128	19
6	☐	128	19
7	☐	128	19
8	☐	128	19
9	☐	128	19
10	☐	128	19
11	☐	128	19
12	☐	128	19
13	☐	128	19
14	☐	128	19
15	☐	128	19
16	☐	128	19

12. At the “Multiple Spanning Tree Protocol” page, create a MSTI 1 setting by following steps.

1.Configure the MSTI parameters and choose which vlan should join this MSTI and click “Add”



2.Choose which port should be included in this MSTI. Click “Add”

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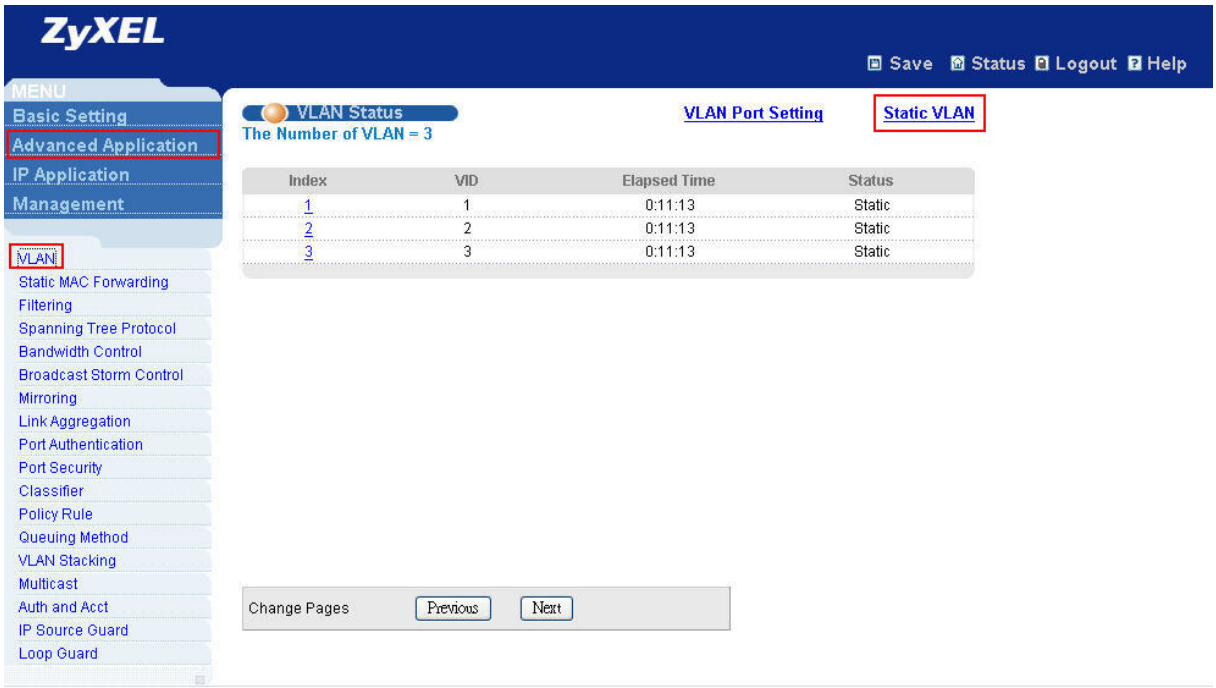
Port	Active	Prority	Path Cost
*	☐		
1	☑	128	19
2	☑	128	19
3	☐	128	19
4	☐	128	19
5	☐	128	19
6	☐	128	19
7	☐	128	19
8	☐	128	19
9	☐	128	19
10	☐	128	19
11	☐	128	19
12	☐	128	19
13	☐	128	19
14	☐	128	19
15	☐	128	19
16	☐	128	19

13. Create vlans corresponding to MST instances.

1.)Go to “Static VLAN” page by clicking “Advanced Application” ”VLAN” “Static VLAN”



2.)Create vlan 2 for MSTI 1 and click “Add”

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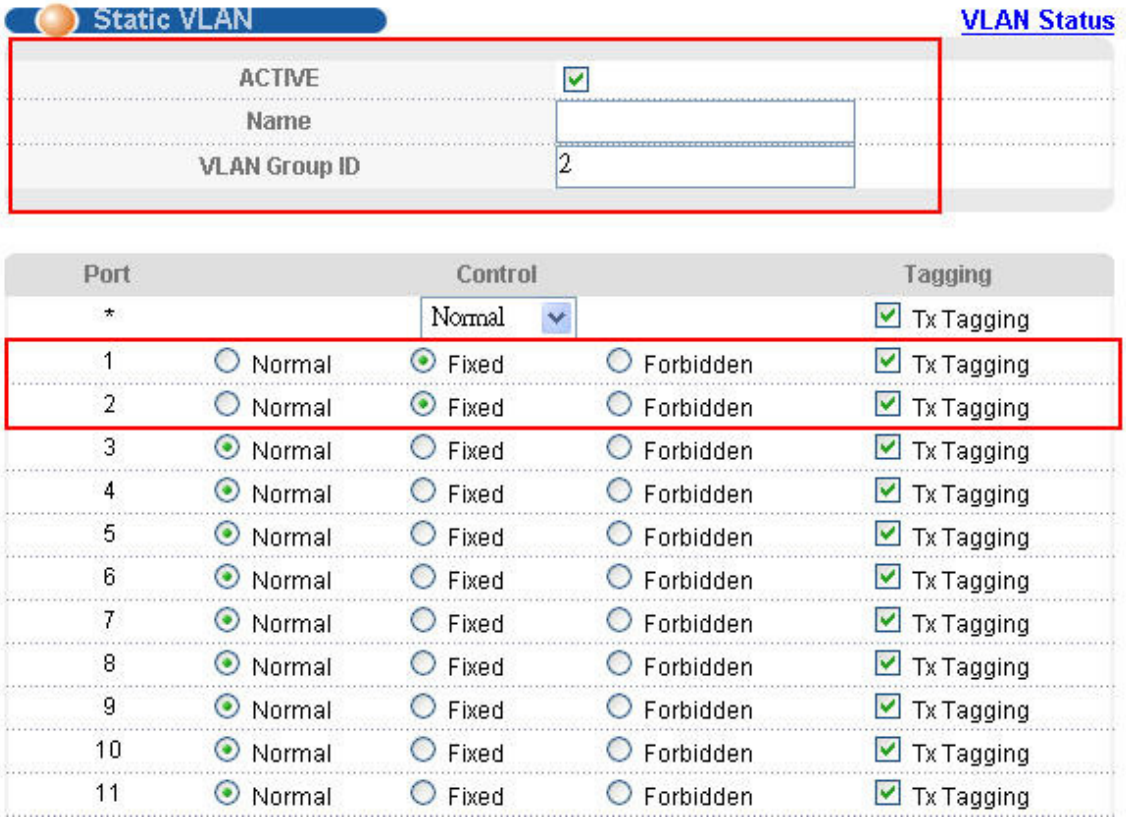

3.)Create vlan 3 for MSTI 2 and click “Add”

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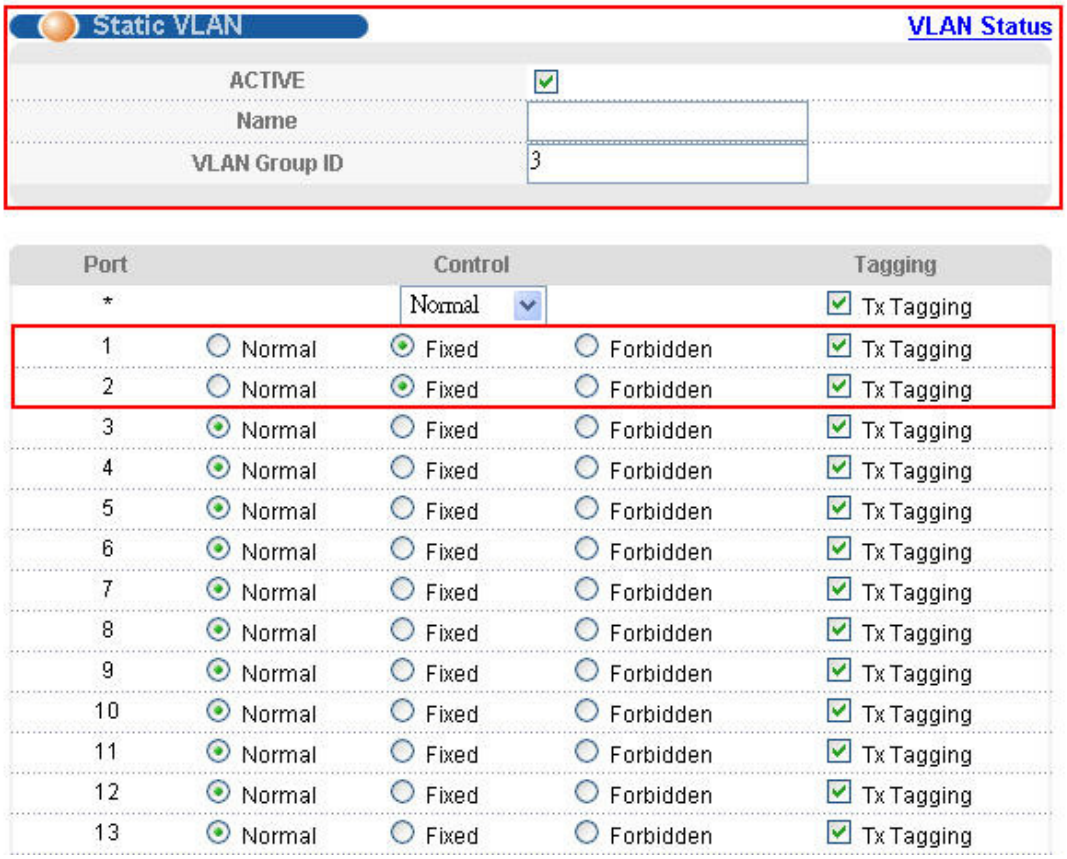

Configuration using the CLI – Switch A

```
vlan 1 name 1
   normal ""
   fixed 1-28
   forbidden ""
   untagged 1-28
   ip address 192.168.1.1 255.255.255.0
exit
vlan 2
   normal 3-28
   fixed 1-2
   forbidden ""
   untagged ""
exit
vlan 3
   normal 3-28
```


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```
   fixed 1-2
   forbidden ""
   untagged ""
exit
interface route-domain 192.168.1.1/24
exit
ip address 192.168.0.1 255.255.255.0
spanning-tree mode MSTP
mstp
mstp configuration-name demo
mstp revision 111
mstp instance 0 vlan 1,4-4094
mstp instance 1 vlan 2
mstp instance 2 vlan 3
mstp instance 0 priority 0
mstp instance 0 interface port-channel 1
mstp instance 0 interface port-channel 2
mstp instance 1 interface port-channel 1
mstp instance 1 interface port-channel 2
mstp instance 2 interface port-channel 1
mstp instance 2 interface port-channel 2
```

Configuration using the CLI – Switch B

```
vlan 1 name 1
   normal ""
   fixed 1-28
   forbidden ""
   untagged 1-28
   ip address 192.168.1.2 255.255.255.0
exit
vlan 2
   normal 3-28
   fixed 1-2
   forbidden ""
   untagged ""
```


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```
exit
vlan 3
   normal 3-28
   fixed 1-2
   forbidden ""
   untagged ""
exit
interface route-domain 192.168.1.2/24
exit
ip address 192.168.0.1 255.255.255.0
spanning-tree mode MSTP
mstp
mstp configuration-name demo
mstp revision 111
mstp instance 0 vlan 1,4-4094
mstp instance 1 vlan 2
mstp instance 2 vlan 3
mstp instance 1 priority 0
mstp instance 0 interface port-channel 1
mstp instance 0 interface port-channel 2
mstp instance 1 interface port-channel 1
mstp instance 1 interface port-channel 2
mstp instance 2 interface port-channel 1
mstp instance 2 interface port-channel 2
```

Configuration using the CLI – Switch C

```
vlan 1 name 1
   normal ""
   fixed 1-28
   forbidden ""
   untagged 1-28
   ip address 192.168.1.3 255.255.255.0
exit
vlan 2
   normal 3-28
```


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```
   fixed 1-2
   forbidden ""
   untagged ""
exit
vlan 3
   normal 3-28
   fixed 1-2
   forbidden ""
   untagged ""
exit
interface route-domain 192.168.1.3/24
exit
ip address 192.168.0.1 255.255.255.0
spanning-tree mode MSTP
mstp
mstp configuration-name demo
mstp revision 111
mstp instance 0 vlan 1,4-4094
mstp instance 1 vlan 2
mstp instance 2 vlan 3
mstp instance 2 priority 0
mstp instance 0 interface port-channel 1
mstp instance 0 interface port-channel 2
mstp instance 1 interface port-channel 1
mstp instance 1 interface port-channel 2
mstp instance 2 interface port-channel 1
mstp instance 2 interface port-channel 2
```

Configuration using the CLI – Switch D

```
vlan 1 name 1
   normal ""
   fixed 1-28
   forbidden ""
   untagged 1-28
   ip address 192.168.1.4 255.255.255.0
```


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```
exit
vlan 2
   normal 3-28
   fixed 1-2
   forbidden ""
   untagged ""
exit
vlan 3
   normal 3-28
   fixed 1-2
   forbidden ""
   untagged ""
exit
interface route-domain 192.168.1.4/24
exit
ip address 192.168.0.1 255.255.255.0
spanning-tree mode MSTP
mstp
mstp configuration-name demo
mstp revision 111
mstp instance 0 vlan 1,4-4094
mstp instance 1 vlan 2
mstp instance 2 vlan 3
mstp instance 0 interface port-channel 1
mstp instance 0 interface port-channel 2
mstp instance 1 interface port-channel 1
mstp instance 1 interface port-channel 2
mstp instance 2 interface port-channel 1
mstp instance 2 interface port-channel 2
```


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