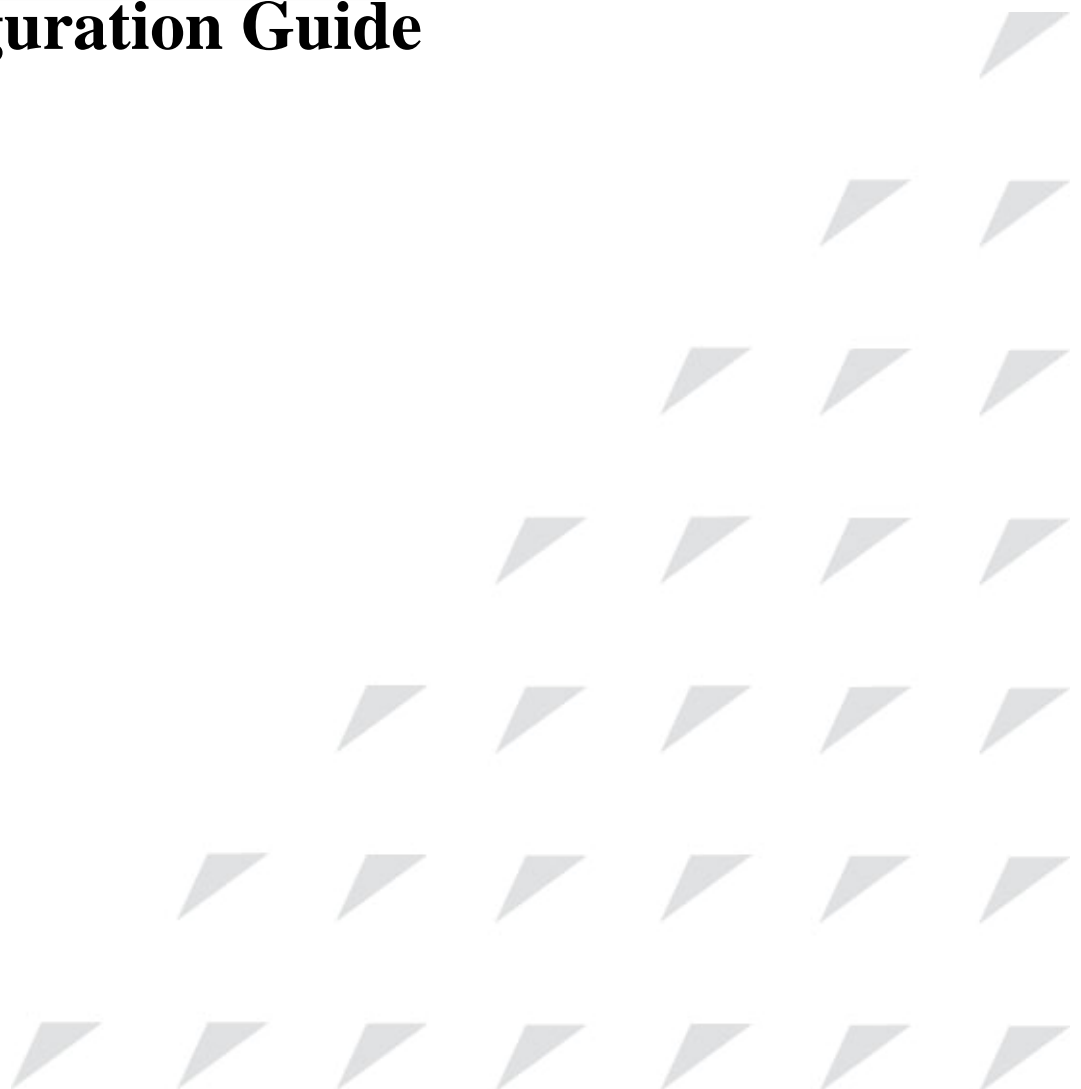


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STP Configuration Guide



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Release Notes

Date of Release	Manual Version	Software Version	Revisions

Preface

About This Manual

This manual introduces primary functions of the configuration management software for RC series products.

Who Should Read This Manual

This manual is a valuable reference for sales and marketing staff, after service staff and telecommunication network designers. For those who want to have an overview of the features, applications, structure and specifications of ... device, this is also a recommended document.

Relevant Manuals

《Raisecom NView System User Manual》

《Raisecom Nview System Installation and Deployment Manual》

《... User Manual》

《... Commands Notebook》

Organization

This manual is an introduction of the main functions of ... EMS. To have a quick grasp of the using of the EMS of ... , please read this manual carefully. The manual is composed of the following chapters

Chapter 1 Overview

This chapter briefly introduces the basic function of ...

Chapter 2 Configuration Management

This chapter mainly introduces the central site configuration management function of the

Chapter 3 Performance Management

This chapter focuses on performance management function of

Chapter 4 Device Maintenance Management

This chapter introduces the device maintenance management function of

Appendix A Alarm Type

The alarm types supported by

Compliance

The RC series products developed by Raisecom are strictly complied with the following standards as well as ITU-T, IEEE, IETF and related standards from other international telecommunication standard organizations:

YD/T900-1997 SDH Equipment Technical Requirements - Clock

YD/T973-1998 SDH 155Mb/s and 622Mb/s Technical conditions of optical transmitter module and receiver module

YD/T1017-1999 Network node interface for the Synchronous Digital Hierarchy (SDH)

YD/T1022-1999 Requirement of synchronous digital hierarchy (SDH) equipment function

YD/T1078-2000 SDH Transmission Network Technique Requirements-Interworking of Network Protection Architectures

YD/T1111.1-2001 Technical Requirements of SDH Optical Transmitter/Optical Receiver Modules——2.488320 Gb/s Optical Receiver Modules

YD/T1111.2- 2001 Technical Requirements of SHD Optical Transmitter/Optical Receiver Modules——2.488320 Gb/s Optical Transmitter Modules

YD/T1179- 2002 Technical Specification of Ethernet over SDH

G.703 Physical/electrical characteristics of hierarchical digital interfaces

G.704 Synchronous frame structures used at 1544, 6312, 2048, 8448 and 44 736 kbit/s hierarchical levels

G.707 Network node interface for the synchronous digital hierarchy (SDH)

G.774 Synchronous digital hierarchy (SDH) - Management information model for the network element view

G.781 Synchronization layer functions

G.783 Characteristics of synchronous digital hierarchy (SDH) equipment functional blocks

G.784 Synchronous digital hierarchy (SDH) management

G.803 Architecture of transport networks based on the synchronous digital hierarchy (SDH)

G.813 Timing characteristics of SDH equipment slave clocks (SEC)

G.823 The control of jitter and wander within digital networks which are based on the 2048 kbit/s hierarchy

G.825 The control of jitter and wander within digital networks which are based on the synchronous digital hierarchy (SDH)

G.826 End-to-end error performance parameters and objectives for international, constant bit-rate digital paths and connections

G.828 Error performance parameters and objectives for international, constant bit-rate synchronous digital paths

G.829 Error performance events for SDH multiplex and regenerator sections

G.831 Management capabilities of transport networks based on the synchronous digital hierarchy (SDH)

G.841 Types and characteristics of SDH network protection architectures

G.842 Interworking of SDH network protection architectures

G.957 Optical interfaces for equipments and systems relating to the synchronous digital hierarchy

G.691 Optical interfaces for single channel STM-64 and other SDH systems with optical amplifiers

G.664 Optical safety procedures and requirements for optical transport systems

I.731 ATM Types and general characteristics of ATM equipment

I.732 ATM Functional characteristics of ATM equipment

IEEE 802.1Q Virtual Local Area Networks (LANs)

IEEE 802.1p Traffic Class Expediting and Dynamic Multicast Filtering

IEEE 802.3 CSMA/CD Access Method and Physical Layer Instruction

Chapter 1 STP Configuration Guide

13.1 STP/RSTP principle introduction

13.1.1 STP purpose

STP (Spanning Tree Protocol) is founded according to 802.1D created by IEEE association, which is used for deleting data link layer physical loop protocol in local area network. The equipments that is running the protocol find loop in the network through exchanging message, and stop some ports selectively, then cut the loop network structure into tree network without any loop, which stop message breeding and looping endlessly, and avoid the host's message handling ability to decline because of receiving the same message.

STP has two meanings, narrowly-defined STP stands for the STP protocol defined in IEEE 802.1D, broadly-defined STP stands for the STP protocol defined in IEEE 802.1D and the modified spanning tree protocols based on it.

13.1.2 STP message

The protocol message STP uses is BPDU (Bridge Protocol Data Unit), which is also called configuration message.

STP transmits BPDU among equipments to make sure the network topology structure. There is enough information to make sure that the equipment finishes the spanning tree's computing.

BPDU is sorted into two types in STP:

- Configuration BPDU: the messages that is doing spanning tree computing and spanning tree topology maintenance.
- TCN BPDU (Topology Change Notification BPDU): the messages used for informing the related equipments network topology change when topology structure changes.

13.1.3 STP overview

1. root bridge

Root bridge is necessary for tree form network structure, so the concept of Root Bridge is taken into STP. There is only one root bridge all through the network, which changes according to network topology's change, so it is not stable.

After network convergence, the root bridge will create and send out configuration BPDU in accordance with a certain time interval, while the other equipments will transmit the configuration BPDU, to keep the topology stability.

2. root port

Root port means the port that is nearest to root bridge on a not-Root Bridge equipment, which sees to the communication to root bridge. There is only one root port on not-Root Bridge equipment, no root port on root bridge.

3. the designated bridge and port

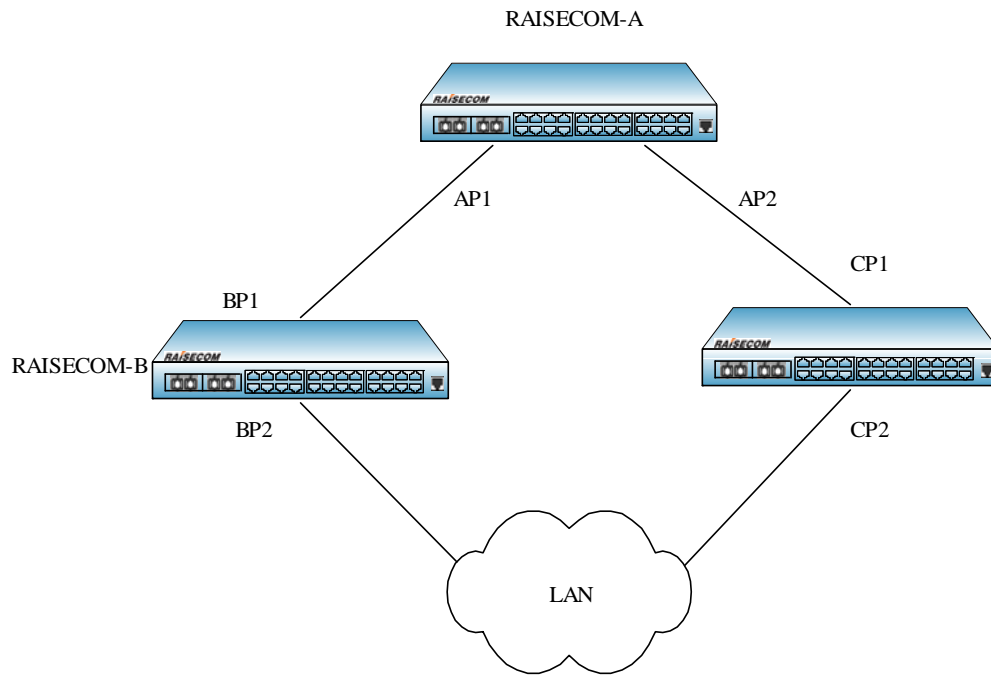


Fig 13-1: the designated bridge and port

The designated bridge and port is shown above, AP1, AP2, BP1, BP2, CP1, CP2 stands for the ports of Device A, Device B, Device C respectively.

Device A uses port AP1 to transmit configuration message to Device B, then the designated bridge of Device B is Device A, the designated port is AP1 of Device A.

There are two equipments that connect local area network: Device B and Device C. If Device B sees to transmitting configuration messages to LAN, the LAN designated bridge is Device B, the designated port is BP2 of Device B.

Notice: all the ports on root bridge are designated ports.

4. path cost

Path cost is the reference value for STP selecting links. By computing path cost, STP chooses the 'strong' link, jams the redundant links and cuts the network into tree form network structure without any loop.

13.1.4 STP basic principle

STP algorithm:

➤ Initialized state:

Each equipment will generate the BPDU message information that take itself as root bridge when it is initialized, the path cost is 0, designates bridge ID as the equipment its own ID, and designated port is the local port.

➤ Optimal allocation information selection:

Each equipment sends out its own configuration information, and receives the configuration information of the other equipments. The process when each port receives configuration information is shown below:

- When the configuration information the port received is lower in priority than its own one,

the equipment will drop the information received, and take no action to the port's configuration information.

- When the configuration information the port received is higher in priority than its own one, the equipment will replace the configuration information content of its own with the received configuration information content.
- Compare all the ports' configuration information and select the optimal configuration information.

Configuration information compare principle:

- The smaller ID configuration information has higher priority;
 - If root bridge ID is the same, compare the following configuration information priority and take the higher priority as the root bridge: the designed bridge ID, the designed port ID, the designed port ID, the port ID that receives the configuration information.
- Root bridge selection

When the network is initialized, all the STP equipments in the network will take themselves' root bridge, the root bridge ID is its own bridge ID. Through exchanging configuration information, the root bridge ID will be compared between the equipments, and the equipment that has the smallest root bridge ID in the network will be selected as the root bridge.

- Root port, the designed port selection

Root port is the port which has the least root bridge path cost, which is used for transmitting data to root node. If several ports have the same path cost to root bridge, the port that has the lowest port priority will be the root port.

Designated port: the port that transmits data to the downstream switch, at the same time sends STP message to maintain the spanning tree state.

STP configuration information transmission mechanism:

- When the network is initialized, all the equipments will take themselves as root bridge, and generate the configuration message that take themselves as root, then send the message out in the term of Hello Time;
- If the port that received configuration information is root port, and the received configuration information is higher in priority than the port configuration information, then the equipment will add Message Age which is taken in configuration message in a certain principle, and start timer to time this configuration, at the same time the configuration information will be transmitted from the designated port of the equipment.
- If the configuration message the designated port received is lower in priority than its own port's configuration message, it will send out better configuration message as response immediately.
- If there is fault on one path, the root port on the path will no longer receive any configuration information new, while the old configuration information will be dropped because of overtime, then the equipment will regenerate the configuration information that take itself as root and send out BPDU and TCN BPDU to trigger spanning tree's re-computing and get a new path to replace the faulted link, which will revert network connection.

However, the new configuration information getting from re-computing will not spread all through the network immediately, so the old root port and designated port will not realize the network topology change and continue transmitting data in the old path. If the newly selected root port and designated port start data transmitting immediately, provisional loop may happen.

STP timer:

- Forward Delay: the delay time of the switch state transformation. Link fault will trigger the network re-compute the spanning tree, and the spanning tree structure will change correspondingly. But the new configuration information that has just been re-computed will not spread all through the net immediately, if the newly selected root port and the designated port start data transmission immediately, it may bring temporary path loop. To stop it, STP take state transformation mechanism. The root port and designated port need to go through a betweenness stage before transmitting data, the stage can enter Forwarding stage only after two times Forward Delay time delay, which confirms that the configuration message has spread all through the network;
- Hello Time is used for detecting if there is fault in the link. The switch will send hello message out every Hello Time to check out if the link has any fault;
- Max Age is the parameter used to judge if the configuration information stored in the switch is 'out of time', the switch will drop the overtime configuration information.

13.1.5 RSTP principle overview

RSTP adds the mechanism that the port can transform from jam state to transmission state on the base of ordinary STP protocol, which quickens the topology convergence speed. In the pot to pot link that is connected with only two switch ports, proposal/agreement mechanism can be brought in and only the designated port's one handshake with downstream bridge, so that the link can be transformed quickly. The port that is connected directly to the terminal, not the other bridges, is defined as edge port, which can go directly into transmission state without out any delay. Because the bridge can not know if the port is connected with the terminal, manual configuration is needed.

13.1.5 STP related protocol and standard

The related protocol includes:

- IEEE 802.1D: Spanning Tree Protocol;
- IEEE 802.1w: Rapid Spanning Tree Protocol;
- IEEE 802.1s: Multiple Spanning Tree Protocol

13.2 Configure STP

13.2.1 Default STP configuration

Function	Default
Global STP function	Disable
Port STP function	Enable
STP and port priority	128
STP and system priority	32768

Network diameter	7
Port cost	Usually according to the physical feature the default value is shown below: 10Mbps: 2000000 100Mbps:200000 1000Mbps: 20000 10Gbps: 2000
The maximum package number every hello time	3
max-age timer	20s
hello-time timer	2s
forward-delay timer	15s

13.2.2 Root bridge/back-up root bridge

Step	Command	Description
1	config	Enter global configuration mode
2	spanning-tree root {primary, secondary}	Set the switch to root switch or back-up root switch for spanning tree
3	exit	Return to privileged EXEC mode
4	show spanning-tree	Show STP configuration

13.2.3 Port priority configuration

Step	Command	Description
1	Config	Enter global configuration
2	interface port <i><1-MAX_PORT_NUM></i>	Enter Ethernet physical port mode
3	[no] spanning-tree priority <0-240>	Set port priority for spanning tree

4	Exit	Return to global configuration mode
5	Exit	Return to privileged EXEC mode
6	show spanning-tree	Show STP configuration

13.2.4 Switch priority configuration

Step	Command	Description
1	config	Enter global configuration mode
2	[no] spanning-tree priority <i><0-61440></i>	Set the switch priority for spanning tree <i>0-61440</i> the switch priority
3	exit	Return to privileged EXEC mode
4	show spanning-tree	Show STP configuration

13.2.5 Path cost configuration

Step	Command	Description
1	Config	Enter global configuration mode
2	interface port <i><1-MAX_PORT_NUM></i>	Enter Ethernet physical port mode <i>1-MAX_PORT_NUM</i> the equipment port number
3	[no] spanning-tree path-cost <i><0-200000000></i>	Set port inner path cost for spanning tree <i>0-200000000</i> port inner path cost
4	Exit	Return to global configuration mode

5	Exit	Return to privileged EXEC mode
6	show spanning-tree	Show STP configuration

13.2.6 Maximum port transmitting rate configuration

Use this command to configure the maximum BPDU number that is allowed to be sent every Hello Time for MSTP. The parameter is a relative value, without any unit. The larger the parameter is set, the larger the message number that is allowed to be sent every Hello Time, and the more switch resource will be cost. Like time parameter, the configuration will take effect only in the root switch. By default, the value is 3. The configuration step is show below:

Step	Command	Description
1	config	Enter global configuration mode
2	[no] spanning-tree transit-limit <i><1-10></i>	Set the switch maximum sending rate
3	Exit	Return to privileged EXEC mode
4	show spanning-tree	Show MSTP configuration

13.2.7 STP timer configuration

- The switch has three time parameter: Forward Delay, Hello Time and Max Age:
 - ✧ Hello Time: the time interval of the switch sending the bridge configuration information (BPDU), which is used for the switch to detect if there is default with the link. Every Hello Time, the switch will send hello message to the switches around to make sure if there is default with the link.

The default value is 2s, user can change the value according to the network situation. When there are frequent changes in the network links, the value can be shortened to enhance the spanning tree protocol stability. Contrarily, enlarging the value will reduce the resource occupancy rate to system CPU of STP.

- ✧ Forward Delay: confirm the time parameter of the switch's state transplant. Link fault will bring the network re-computing the spanning tree, and the STP structure will change accordingly, but the new configuration information by computing will not spread all through the network. If the newly selected root port and the specified port start data transmission immediately, provisional route cycle may happen. To prevent this, the protocol take a state transplant mechanism: the root port and designated port will have to go through a betweenness before data transmission, and only when the betweenness goes through Forward Delay can the ports enter transmission state. This delay confirms that the new configuration information has spread all through the network.

The default value is 15s, user can change it according to the situation, increase the value when the network topology change is not frequent, and decrease it on the contrary.

- ✧ Max Age: the bridge configuration information that STP uses has lifecycle to judge if the configuration information is out of time. The switch will drop the outdated configuration information. When the bridge configuration information is out of time, the spanning tree protocol will re-compute the spanning tree.

The default value is 20s, a smaller value will result in the spanning tree re-computing much too frequent, while a value that is much too large will lead to the spanning tree protocol unfitness to the network topology structure change.

Step	Command	Description
1	config	Enter global configuration mode
2	[no] spanning-tree hello-time <1-10>	Set the switch time parameter Hello Time
3	[no] spanning-tree forward-delay <4-30>	Set the switch time parameter Forward Delay
4	[no] spanning-tree max-age <6-40>	Set the switch time parameter Max Age
5	exit	Return to privileged EXEC mode
6	show spanning-tree	Show MSTP configuration

13.2.8 Configure edge port

13.2.9 STP mcheck operation

There are two working mode on the switch that supports MSTP: STP compatible mode and MSTP mode. If in a network the port of the switch that is running MSTP is connected with the switch that is running STP, the port will change into STP compatible mode automatically. But if the switch that is running STP is removed, the port can not change into MSTP mode automatically, but still works in STP compatible mode. Of course, if the port receives new STP message later, the port will return to STP compatible mode. The configuration step is shown below:

Step	Command	Description
1	Config	Enter global configuration mode
2	interface port <1-MAX_PORT_NUM>	Enter Ethernet physical port mode <i>MAX_PORT_NUM</i> the maximum port number that the equipment supports.
3	spanning-tree mcheck	Force the port to move back to

MSTP mode		
4	Exit	Return to global configuration mode
5	Exit	Return to privileged EXEC mode
6	show spanning-tree	Show MSTP configuration

13.2.10 Configure STP/RSTP mode switch

Step	Command	Description
1	Config	Enter global configuration mode
3	spanning-tree mode{stp rstp mstp}	Configure spanning tree work mode
4	Exit	Return to global configuration mode
5	Exit	Return to privileged EXEC mode
6	show spanning-tree	Show MSTP configuration

13.2.11 Configure link type

The two ports that is connected by point to point link can move to transmission state rapidly through transmitting synchronal message, which decreases unnecessary transmission delay time. By default, MSTP sets the link type of the port according to duplex state. Full duplex port is thought to be point to point link, while half duplex is thought to be shared link.

Users can configure by hand to force the current Ethernet ports and point-to-point link connected, but if the link point-to-point link is not a problem in the system would, under normal circumstances, the proposed user of this configuration is set automatically, by Automatic port discovery is linked with point-to-point link. Reverse order no spanning-tree link-type link state port to restore the default values. Specific configuration steps are as follows:

Step	Command	Description
1	Config	Enter global configuration mode
2	interface port <i><1-MAX_PORT_NUM></i>	Enter Ethernet physical port mode
		<i>MAX_PORT_NUM</i> the maximum

		port number that the equipment supports
3	spanning-tree link-type { point-to-point shared }	Set the port's link type
4	Exit	Return to global configuration mode
5	Exit	Return to privileged EXEC mode
6	show spanning-tree	Show MSTP configuration.

13.2.12 Statistics clear configuration

Step	Command	Description
1	Config	Enter global configuration mode
2	interface port <i><1-MAX_PORT_NUM></i>	Enter Ethernet physical port mode <i>MAX_PORT_NUM</i> the maximum port number that the equipment supports.
3	spanning-tree clear statistics	Clear the port stat. information to zero
4	Exit	Return to global configuration mode
5	Exit	Return to privileged EXEC mode
6	show spanning-tree	Show MSTP configuration

13.2.13 Monitoring and maintaining

Command	Description
show spanning-tree	Show the basic information of spanning tree
show spanning-tree detail	Show the detailed information of the spanning

tree

show spanning-tree port-list	Show the basic information of the spanning
[portlist]	tree port list
show spanning-tree port-list	Show the detailed information of the spanning
[portlist] detail	tree port list

13.2.14 Typical configuration instance

- There are 3 RAISECOM switch, A, B, C increase according to the equipment MAC address. By configuring the switch priority to select the root bridge to A or B freely, so that the topology can be changed;
- Network structure figure:

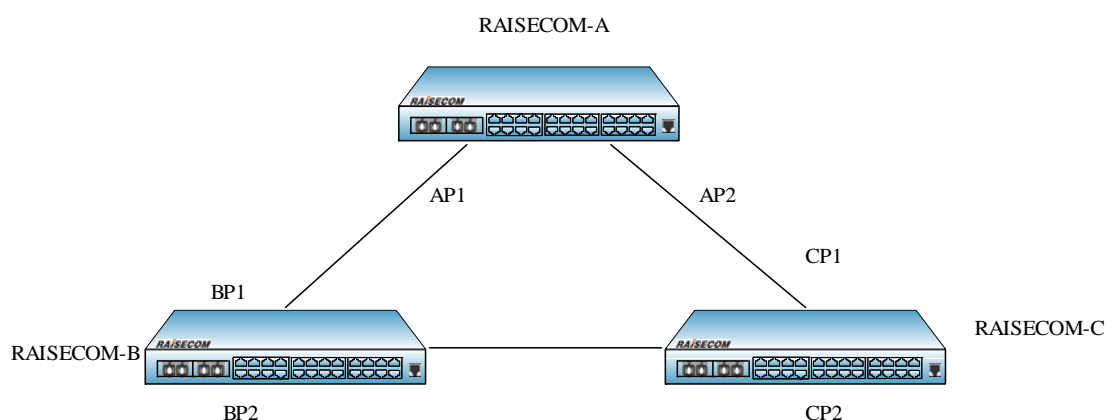


Fig 13-2: network structure

- Configuration step:

Open A, B, C global STP:

```
Raisecom(config)#spanning-tree enable;
```

Set the STP working mode of port AP1, AP2, BP1, BP2, CP1, CP2 to RSTP;

By default, check out the stable topology structure:

```
Raisecom#show spanning-tree
```

A: the switch's AP1, AP2, as the designated port is in normal transmission state;

B: the switch's BP1, as the root port, is in normal transmission state, while BP2 is in block state;

C: the switch's CP1, as the root port, is in normal transmission state, while CP2 is in block state;

Set the priority of B to 4096, and repeat the following step:

```
Raisecom(config)#spanning-tree priority 4096
```

When the topology is stable the root bridge will change into A, the port AP2, BP1 between A and c

will be in block state.

MSTP configuration

13.3 MSTP principle introduction

13.3.1 MSTP overview

MST regions (Multiple Spanning Tree Regions), is made of several switches in the switch network and the network segments between them. These switches have all started MSTP, own the same domain name, VLAN to spanning tree mapping configuration and the same MSTP modification class configuration, and have physical link connection.

MSTI (Multiple Spanning Tree Instance) is the spanning tree in the MST domain. A MST domain can create several spanning trees through MSTP, each tree is independent.

VLAN mapping table is an attribution of MST domain. IST and CST (Common Spanning Tree) constitute the switch network spanning tree (Common and Internal Spanning Tree). IST is part of CIST in MST domain, which is a special multi-spanning tree instance.

CST is the simple spanning tree connecting all the MST domain in the switch network. If each MST is seen as a 'switch', CST is a spanning tree computed by the 'switches' using STP and RSTP.

CIST is a single spanning tree connected with all the MST domain in the switch network, which is formed by IST and CST.

Domain root means the tree root of IST and MSTI in the MST domain. The topology of each spanning tree in the MST domain is different, so the domain root may be different as well. Common Root Bridge means the tree root of CIST.

13.3.2 MSTP principle

MSTP divide the two-layer network into several MST domain, between each domain the CST is created by computing, while in the domain several spanning tree is created by computing by computing, each spanning tree is called a MSTI.

- The computing of CIST spanning tree

After comparing the configuration information, the switch that has the highest priority all through the network will be selected as the tree root of the switch. In each MST domain MSTP will create IST through computing, while MSTP will treat each MST domain as a single switch, and create CST in the MST domain by computing. CST and IST constitute the switch network CIST.

- MSTI computing

In the MST domain, according to the mapping relationship between VLAN and the spanning tree instance, MSTP will generate different spanning tree instance for different VLAN. Each spanning tree will make calculation respectively, the calculation process is similar with the process of STP/RSTP spanning tree computing.

- STP algorithm process

It is the same with STP/RSTP.

13.4 MSTP configuration

13.4.1 The default MSTP configuration

Function	Default value
Global MSTP function	Disabled
PORT MSTP function	Enabled
Max jump number of MST domain	20
The priority of STP port	128
The system priority of STP	32768
Network diameter	7
Port cost	According to the physical features, the usual situation by default is show below: 10Mbps: 2000000 100Mbps: 200000 1000Mbps: 20000 10Gbps: 2000
Max packet sent out number every Hello Time	3
max-age timer	20s
hello-time timer	2s
forward-delay timer	15s
MST domain modifying priority	0

13.4.2 MSTP domain configuration

When the switch running in MSTP mode, the switch can be configured the domain information where it belongs to. Which MST domain a switch belongs to is determined by the domain name, VLAN mapping table and MSTP modification configuration. By the following steps user can put the current switch into a special MST domain.

Annotation: MST domain configuration view is used here. To configure MST domain name, modification class and the relationship between VLAN and instances, it is needed to enter MST domain view. If the configuration is not enabled, then the configuration information will only be recorded but not activated. The configuration is shown below:

Step	Command	Description
1	config	Enter global configuration mode
2	spanning-tree region-configuration	Enter MST domain configuration mode
3	[no] name <i>name</i>	Set MST domain name
4	[no] revision-level <i>level</i>	Set MST domain modification class; Level: modification class, range is 0-65535, the default value is 0
5	instance <0-4095> vlan <1-4094>	Set mapping relationship from VLAN to instances for MST domain. 0-4095 the instance number; 1-4094 VLAN ID
6	exit	Return to global configuration mode
7	spanning-tree region-configuration active	Activate MST domain configuration information
8	exit	Return to privileged EXEC mode
9	show spanning-tree region-configuration	Show MST domain configuration information.

13.4.3 Configure MSTP domain maximum hop number

MST domain maximum hop number confines the scope of MST domain. Only when the configured switch is the domain root, can the configured maximum hop number be taken as MST domain maximum hop number, while other not-domain root switches configuration is not valid on it.

From the root switch of the spanning tree in the domain, BPDU in the domain hop number will decrease by 1 when transmitted by one switch, and the switch will drop the configuration information that receives 0 hop number. It will make the switch that is out of the max hop number not being able to take part in the spanning tree calculation, which confines the scope of MST domain.

For instance: if the maximum hop number of the domain root switch is set to 1, the spanning tree function in the domain is not available, because only this switch takes part in the spanning tree computing. By default, the maximum hop number is 20, or to hop down 19 steps along the spanning

tree path from the domain root. The configuration is shown below:

Step	Command	Description
1	config	Enter global configuration mode
2	[no] spanning-tree max-hops <i><1-40></i>	Set the maximum hop number of the switch MST domain
3	exit	Return to privileged EXEC mode
4	show spanning-tree	Show MSTP configuration

13.4.4 Configure root bridge/back-up root bridge

On the one hand, MSTP can configure the switch priority, and then after a spanning tree calculation, to determine the root of the tree root switch to back up or exchange; On the other hand, the user can also specify the order directly. It should be noted that if the root switch designated direct way, then the whole network, users can not modify the proposed switch to any of the priority; Otherwise, the root cause designated switch or switch back up the root is invalid.

Users can instance instance-id parameter to determine the root switch, or switch to back up the root of the entry into force of instance. If the instance-id value is 0, or omit parameters instance instance-id, the current switch will be designated as the root of the CIST or switch to back up the root switch.

In the instance of the current switch in the type of root is independent of each other, that is, it can be used as an instance of the root switch or switch back up the root, at the same time as other instances of tree roots or switch to back up the root switch. But at the same instance of a tree, the same can not switch it as a root switch and root as a backup switch.

At the same time, the user can not be designated as an instance of spanning tree two or more root switch; On the contrary, the user can specify multiple spanning tree with a back-up roots. Under normal circumstances, the proposal for a user to specify a spanning tree roots and a number of back-up roots.

When the root switch failure or shutdown, the switch can replace the backup root root switch into the corresponding instance of the root switch. However, at this time if the user has set up a new root switch, then switch back up the root will not be a root switch. If a user to configure a number of instances spanning tree root switch back up, when the root switch fails, MSTP will choose the smallest of the MAC address of the switch as a backup root switch.

By default, the switch can not be taken as the root switch of the spanning tree or the back-up root switch of the spanning tree. Use **no spanning-tree[instance instance-id] root** revert command to restore the default configuration. Specific configuration steps are as follows:

Step	Command	Description
1	config	Enter global configuration mode

2	spanning-tree [instance <i>instance-id</i>] root { primary , secondary }	For a certain spanning tree instance, set the switch as the root switch or back-up root switch. <i>instance-id</i> instance number, range is 0-4095
3	exit	Return to privileged EXEC mode
4	show spanning-tree	Show MSTP configuration

13.4.5 Configure the port priority

Spanning tree protocol spanning tree calculation, the elections need to root port (root port) and designated ports (designated port), in the path of the port costs in line under the premise of the port-side ID of the smaller ports more vulnerable to root for the election or designated port. Users can set up port priority, to reduce port ID, and then there's the purpose of controlling spanning tree protocol to choose a specific port to become the root port or the designated port. With the same priority, the port that has smaller number has higher priority.

Same with the priority of configuring the switch, port priority is independent in different cases. Users can use **instance** *instance-id* parameter to determine the configuration of port-priority case. If the *instance-id* value is 0 or parameters **instance** *instance-id* is omitted, it is configured for the CIST port priority.

Note: The value of priority must be a multiple of 16, such as 0,16,32,48 and so on, the default value of 128. Specific configuration steps are as follows:

Step	Command	Description
1	Config	Enter global configuration mode
2	interface port <1- <i>MAX_PORT_NUM</i> >	Enter ethernet physical port mode; <i>MAX_PORT_NUM</i> the maximum port number that the equipment supports
3	[no] spanning-tree [instance <i>instance-id</i>] priority <0-240>	Set port priority for a certain spanning tree instance <i>instance-id</i> instance

		number, range is 0-4095
		0-240 port priority value
4	Exit	Return to global configuration mode
5	Exit	Return to privileged EXEC mode
6	show spanning-tree	Show MSTP configuration

13.4.6 Configure the switch priority

Bridge ID switch determines if the size of this switch can be selected as the root of the tree. Through the allocation of a smaller priority, the smaller switches Bridge ID can be got so that a certain switch can be the spanning tree root. Priority same, MAC address for the small roots.

Same with the configuration root and backup root, the priority is independent with each other in different instance configurations. Users can use **instance** instance-id parameter to determine the priority allocation of instance. If the instance-id value is 0, or when the parameters **instance** instance-id is omitted, it is configured for the CIST bridge priority

Note: The value of priority must be in multiples of 4096, such as 0, 4096, 8192, and so on, the default value is 32,768. Specific configuration steps are as follows:

Step	Command	Description
1	config	Enter global configuration mode
2	[no] spanning-tree [instance instance-id] priority <0-61440>	Set port priority for a certain spanning tree instance instance-id instance number, range is 0-4095 0-61440 port priority value
3	exit	Return to privileged EXEC mode
4	show spanning-tree	Show MSTP configuration

13.4.7 Configure the network diameter of the switch network

RSTP in the agreement, the network diameter refers to the number of switches in the network to exchange up to the path that, switch the number of nodes. MSTP in the agreement, the network

diameter settings only effective CIST for example MSTI invalid. And in the same region, no matter how many nodes path, just as a computing node. This fact, the network should be defined as the diameter across the domain up to that path, the number of domains. If the network has only one domain, then running network diameter is 1.

MST with the domain of the largest jump a few similar, if and only if the switch configuration for the CIST root switch, configure the entry into force.

Comparison of the MST's largest domain is used to jump a few domain characterization of the size of the network diameter is the characterization of the entire network of the size of a parameter. Network that the greater the diameter of a larger network.

When the user switches to configure the network parameters in diameter, MSTP through the switch will automatically calculate the Hello Time, Forward Delay, and Max Age three times to set the parameters for a better value.

Default network with a diameter of 7, the corresponding three time are their default values respectively. Specific configuration steps are as follows:

Step	Command	Description
1	config	Enter global configuration mode
2	[no] spanning-tree bridge-diameter <2-7>	Set the diameter of the switch network
3	exit	Return to privileged EXEC mode
4	show spanning-tree	Show MSTP configuration

13.4.8 Path cost configuration

When STP is computing the spanning tree, it is needed to vote root port and designated port, the less the port patch costs, the easier the port be voted as root port or designated port. Users can use **instance** instance-id parameter to determine the instance of the port inner path cost of the configured port. If the instance-id value is 0, or when the parameters **instance** instance-id is omitted, it is configured for the CIST inner patch cost.

Usually port cost depends on the physical features, the default case is:

- 10Mbps is 2000000;
- 100Mbps is 200000;
- 1000Mbps is 20000;

Specific configuration is as follows:

Step	Command	Description
1	Config	Enter global configuration mode

2	interface port <1- <i>MAX_PORT_NUM</i> >	Enter Ethernet physical interface mode <i>MAX_PORT_NUM</i> the maximum port number that the equipment supports
3	[no] spanning-tree [instance <i>instance-id</i> path-cost <0-200000000>	Set the port inner patch cost for a certain spanning tree instance <i>instance-id</i> instance number, range is 0-4095 200000000 the maximum patch cost value
4	Exit	Return to global configuration mode
5	Exit	Return to privileged EXEC mode
6	show spanning-tree	Show MSTP configuration

13.4.9 Configure the port's maximum sending rate

Use the command to configure the maximum BPDU number that is allowed to be sent every Hello Time for MSTP. This parameter is a relative value, not units, the configuration parameters have been greater, each with Hello Time allowed to send the message, the more the number, but also will take up more resources to switch. With the same parameters of the time, only the root switch configuration comes into force.

By default, this value is 3. Specific configuration steps are as follows:

Step	Command	Description
1	config	Enter global configuration mode
2	[no] spanning-tree transit-limit <i><1-10></i>	Set the switch port maximum sending rate
3	Exit	Return to privileged EXEC mode
4	show spanning-tree	Show MSTP configuration

13.4.10 Configure STP timer

- There are three time parameter: Forward Delay, Hello Time and Max Age:
 - ✧ Hello Time: the time interval of the switch's sending BPDU, which is used to determine if there is fault in the link. Every Hello Time the switch will send hello message to the switches nearby to make sure if there is fault with the link.

The default value is 2s, user can change the value according to the network state. If there is frequent change in network links, the value can be shortened in a certain degree to enhance STP stability. On the opposite, enlarging the value will decrease STP resource taken rate to the system CPU.

- ✧ Forward Delay: to make sure the time parameter of the switch state safe transformation. Link fault will bring in the re-computing of the spanning tree and the corresponding change of the network structure, but the new configuration information that is re-computed can not spread all through the network. If the newly elected root port and designated port started immediately transmit the data, may cause a temporary path of the loop. To this end an agreement to adopt a state transfer mechanism: the root port and designated port will go through a betweenness before data re-transmission (state of learning), a state in the middle Forward Delay after delay of time before they can enter the state forward. The delay to ensure that the new configuration information has been spread throughout the network.

Default value is 15 seconds, the user can adjust the value of the actual situation, when the network topology changes frequently are not able to reduce the value, increasing the contrary.

- ✧ Max Age: the bridge configuration information that is used by the spanning tree protocol has life cycle to determine whether the configuration information is out of date. The switch will discard the configuration information out of date. When the bridge configuration information expired, spanning tree protocol will be re-spanning tree.

Default is 20 seconds, the value is too small will lead to weight spanning tree calculation too often, too much will lead to spanning tree protocol in a timely manner can not adapt to the network topology.

The entire network to exchange all of the switches used CIST root switch on the three parameters of the time, only in the root switch configuration on the entry into force. Specific configuration steps are as follows:

Step	Command	Description
1	config	Enter global configuration mode
2	[no] spanning-tree hello-time <i><1-10></i>	Set the switch time parameter Hello Time
3	[no] spanning-tree forward-delay <i><4-30></i>	Set the switch time parameter Forward Delay
4	[no] spanning-tree max-age <i><6-40></i>	Set the switch time parameter Max Age

5	exit	Return to privileged EXEC mode
6	show spanning-tree	Show MSTP configuration

13.4.11 Configure edge port

Edge port: the port that has no direct connection to the switch or indirect connection to any switch through the network.

Configure the edge port so that the port state can transform into transmission state rapidly, without waiting for; for Ethernet port that is has direct connection with user's terminal equipment, it is supposed to be set to edge port for rapid transformation to transmission state.

If a port is set to edge port auto detection (auto), then the attribution of the edge port is decided by the actual situation. If a port is set to edge port (force-true), when the port receive BPDU the actual running value will become not-edge port, which will keep the state until the configuration is changed.

By default, all the network switch ports will be set to auto-detect. The reverse command **no spanning-tree edged-port** restores the default value of the edge port attribution. Specific configuration is as follows:

Step	Command	Description
1	Config	Enter global configuration mode
2	interface port <i><1-MAX_PORT_NUM></i>	Enter Ethernet physical port mode <i>MAX_PORT_NUM</i> the maximum port number that the equipment supports
3	spanning-tree edged-port { auto force-true force-false }	Set the edge port attribution.
4	Exit	Return to global configuration mode
5	Exit	Return to privileged EXEC mode
6	show spanning-tree	Show MSTP configuration

13.4.12 STP mcheck operation

There are two working mode on switch ports that support MSTP: STP compatible mode and MSTP mode. Assuming an exchange network run MSTP switch port connected to the operation of the STP switches, the port will be automatically moved to the STP compatibility mode. However, at this time

if the operation of the STP switch will be pulled away from the agreement, the port can not be automatically moved to the MSTP mode, STP will continue to work in the compatibility mode to run. At this point by **mcheck** operation it can be moved to MSTP mode. Of course, if later this port receives a new message STP again, the port will return to the STP compatibility mode. Specific configuration steps are as follows:

Step	Command	Description
1	Config	Enter global configuration mode
2	interface port <i><1-MAX_PORT_NUM></i>	Enter Ethernet physical port mode <i>MAX_PORT_NUM</i> the maximum port number that the equipment supports
3	spanning-tree mcheck	Force the port to move to MSTP mode
4	Exit	Return to global configuration mode
5	Exit	Return to privileged EXEC mode
6	show spanning-tree	Show MSTP configuration

13.4.13 Configure STP/MSTP mode switch

When STP is enabled, two spanning tree mode is supported: STP compatible mode and MSTP mode.

- STP compatible mode: do not implement the rapid transformation from alternate port to root port. Only STP configuration BPDU and topology change notice (STP TCN BPDU) will be sent out. The un-identified part will be dropped when MST BPDU is received.
- MSTP mode: sending MSTP BPDU. If the opposite end of the local switch port is running STP, the port will move to STP compatible mode. If the opposite end of the local switch port is running RSTP, the local will keep MSTP and take it only as out domain information.

The steps to configure the switch spanning tree mode are as follows:

Step	Command	Description
1	config	Enter global configuration mode
2	spanning-tree mode {stp mstp}	Set the spanning tree running mode
3	exit	Return to privileged EXEC

		mode
4	show spanning-tree	Show MSTP configuration

13.4.14 Configure link type

By transmitting synchronal message the two ports that is connected by point to point link can move to transmission state rapidly, which reduces the unnecessary transmission delay. By default, MSTP set the link type of the port according to duplex state. Full duplex port is seen as point to point link, while half duplex port is seen as shared link.

Users can configure by hand to force the current Ethernet ports and point-to-point links connected, but the system will get into trouble if the link is not point to point link, usually it is supposed that this configuration is set to be auto so that the system will find out if the ports are connected with point to point link. Reverse command **no spanning-tree link-type** recovers the default value of the link state of the port. Specific configuration are as follows:

Step	Command	Description
1	Config	Enter global configuration mode
2	interface port <1-MAX_PORT_NUM>	Enter Ethernet physical port mode MAX_PORT_NUM the maximum port number that the equipment supports
3	spanning-tree link-type {point-to-point shared}	Set the link type of the port
4	Exit	Return to global configuration mode
5	Exit	Return to privileged EXEC mode
6	show spanning-tree	Show MSTP configuration

13.4.15 Configure static clear

MSTP counts each MSTP port BPDU message number of the following types: in STP message, in RSTP message, in MSTP message, out STP configuration message, out SRTP message (to the switch that is running MSTP, it will be zero forever), out MSTP message.

The steps to clear MST port statistics are as follows:

Step	Command	Description
1	Config	Enter global configuration

		mode
	interface port <1- <i>MAX_PORT_NUM</i> >	Enter Ethernet physical port mode <i>MAX_PORT_NUM</i> the maximum port number that the equipment support
2	spanning-tree clear statistics	Clear the port statistics to zero
3	Exit	Return to global configuration mode
4	Exit	Return to privileged EXEC mode
5	show spanning-tree	Show MSTP configuration

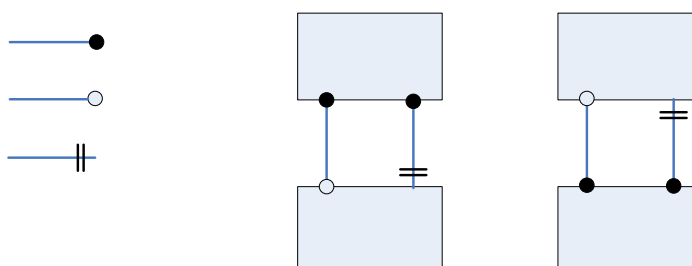
13.5 Maintaining and management

- ✧ Show spanning-tree region-configuration: show MST domain configuration.
- ✧ Show spanning-tree [instance instance-id]: show multi-spanning tree instance basic information.
- ✧ Show spanning-tree [instance instance-id] detail: show multi-spanning tree instance detail.
- ✧ Show spanning-tree [instance instance-id] port-list[portlist]: show the basic information of multi-spanning tree instance port list.
- ✧ Show spanning-tree [instance instance-id] port-list[portlist] detail: show the detail of multi-spanning tree instance port list.

13.5.1 Show instances

The result shown in the following sections are all according to the instance configuration described in the section, the switch that is for display is switch B in the example, the switch that uses this example is rc2828f (28 ports in all).

1. Topology voting figure and basic configuration



2. MST command configuration

```
Switch A:
Raisecom#
SW_A#con
SW_A(con

SW_A(con
SW_A(con
SW_A(con
SW_A(con
```

unk
owed vl

13.5.2 Show MST domain configuration information

```
SW_A(config)#interface port 2
SW_A(config-port)#switchport mode trunk
SW_A(config-port)#switchport trunk allowed vl
SW_A(config-port)#exit

➤ Command: show spanning-tree region-configuration
➤ Function: to show MST domain configuration information, including: the inactive and valid domain, modification class and VLAN mapping table.
➤ Show result:

Raisecom#show spanning-tree region-configuration
Configured:
-----
Name: aaa
Revision level: 2
Instance      Vlans Mapped
-----
0             1-10,21-4094
3             11-20

Operational:
-----
Name: aaa
Revision level: 2      Instances configured: 2
Instances running: 2
```

Digest: 0x213106D1D279FAE00D24B8297D35EC69

Instance	Vlans Mapped
0	1-10,21-4094
3	11-20

13.5.3 Show multi-spanning tree instance basic information

- Command: **show spanning-tree [instance instance-id]**
- Function: show all the spanning tree instances or the given spanning tree instance and the port basic information of the instance. Without the parameter **instance** instruction, all the instances and instance port information will be shown.
- Show the result:

Raisecom# show spanning-tree

MSTP Admin State: Enable

Protocol Mode: MSTP

MST ID: 0

BridgeId: Mac 000E.5E00.1864 priority 8192

Root: Mac 000E.83E3.7580 Priority 4096 ExternalRootCost 0

RegionalRoot: Mac 000E.83E3.7580 Priority 4096 InternalRootCost 200000

Operational: hello time 2, forward delay 15, max age 20

Configured: hello time 2, forward delay 15, max age 20

transmit limit 3, max hops 20, diameter 7

PortId	PortState	PortRole	PathCost	PortPriority	LinkType	TrunkPort
1	discarding	disabled	200000	128	point-to-point	no
2	discarding	disabled	200000	128	point-to-point	no
3	discarding	disabled	200000	128	point-to-point	no
4	discarding	disabled	200000	128	point-to-point	no
5	discarding	disabled	200000	128	point-to-point	no
6	discarding	disabled	200000	128	point-to-point	no
7	discarding	disabled	200000	128	point-to-point	no
8	discarding	disabled	200000	128	point-to-point	no
9	discarding	disabled	200000	128	point-to-point	no
10	discarding	disabled	200000	128	point-to-point	no
11	discarding	disabled	200000	128	point-to-point	no

12	discarding	disabled	200000	128	point-to-point	no
13	discarding	disabled	200000	128	point-to-point	no
14	discarding	disabled	200000	128	point-to-point	no
15	discarding	disabled	200000	128	point-to-point	no
16	discarding	disabled	200000	128	point-to-point	no
17	discarding	disabled	200000	128	point-to-point	no
18	discarding	disabled	200000	128	point-to-point	no
19	discarding	disabled	200000	128	point-to-point	no
20	discarding	disabled	200000	128	point-to-point	no
21	discarding	disabled	200000	128	point-to-point	no
22	discarding	disabled	200000	128	point-to-point	no
23	discarding	disabled	200000	128	point-to-point	no
24	discarding	disabled	200000	128	point-to-point	no
25	discarding	disabled	200000	128	point-to-point	no
26	discarding	disabled	200000	128	point-to-point	no
27	forwarding	root	200000	128	point-to-point	no
28	discarding	alternate	200000	128	point-to-point	no

MST ID: 3

 BridgeId: Mac 000E.5E00.1864 priority 32768

RegionalRoot: Mac 000E.5E00.1864 Priority 32768 InternalRootCost 0

PortId	PortState	PortRole	PathCost	PortPriority	LinkType	TrunkPort
--------	-----------	----------	----------	--------------	----------	-----------

27	forwarding	designated	200000	128	point-to-point	no
28	forwarding	designated	200000	128	point-to-point	no

13.5.4 Show multi-spanning tree instance detail

- Command: **show spanning-tree [instance instance-id] detail**
- Function: show all the spanning tree instances or the given spanning tree and the detail of the instance port. Without the parameter **instance**, all the instances and the detail of the instance port.
- Show the result:

Raisecom# show spanning-tree instance 0 detail

MSTP Admin State: Enable

Protocol Mode: MSTP

MST ID: 0

BridgeId: Mac 000E.5E00.1864 priority 8192

Root: Mac 000E.83E3.7580 Priority 4096 ExternalRootCost 0

RegionalRoot: Mac 000E.83E3.7580 Priority 4096 InternalRootCost 200000

Operational: hello time 2, forward delay 15, max age 20

Configured: hello time 2, forward delay 15, max age 20

transmit limit 3, max hops 20, diameter 7

Port 1 :

State:discarding Role:disabled Priority:128 Cost:200000 TrunkPort:no

Root: Mac 0000.0000.0000 Priority 0 ExternalPathCost 0

RegionalRoot: Mac 0000.0000.0000 Priority 0 InternalPathCost 0

DesignatedBridge: Mac 0000.0000.0000 Priority 0 DesignatedPort 0

Port 2 :

State:discarding Role:disabled Priority:128 Cost:200000 TrunkPort:no

Root: Mac 0000.0000.0000 Priority 0 ExternalPathCost 0

RegionalRoot: Mac 0000.0000.0000 Priority 0 InternalPathCost 0

DesignatedBridge: Mac 0000.0000.0000 Priority 0 DesignatedPort 0

Port 3 :

State:discarding Role:disabled Priority:128 Cost:200000 TrunkPort:no

Root: Mac 0000.0000.0000 Priority 0 ExternalPathCost 0

RegionalRoot: Mac 0000.0000.0000 Priority 0 InternalPathCost 0

DesignatedBridge: Mac 0000.0000.0000 Priority 0 DesignatedPort 0

Port 4 :

State:discarding Role:disabled Priority:128 Cost:200000 TrunkPort:no

Root: Mac 0000.0000.0000 Priority 0 ExternalPathCost 0

RegionalRoot: Mac 0000.0000.0000 Priority 0 InternalPathCost 0

DesignatedBridge: Mac 0000.0000.0000 Priority 0 DesignatedPort 0

Port 5 :

State:discarding Role:disabled Priority:128 Cost:200000 TrunkPort:no

Root: Mac 0000.0000.0000 Priority 0 ExternalPathCost 0

RegionalRoot: Mac 0000.0000.0000 Priority 0 InternalPathCost 0

DesignatedBridge: Mac 0000.0000.0000 Priority 0 DesignatedPort 0

Port 6 :

State:discarding Role:disabled Priority:128 Cost:200000 TrunkPort:no
Root: Mac 0000.0000.0000 Priority 0 ExternalPathCost 0
RegionalRoot: Mac 0000.0000.0000 Priority 0 InternalPathCost 0
DesignatedBridge: Mac 0000.0000.0000 Priority 0 DesignatedPort 0
Port 7 :
State:discarding Role:disabled Priority:128 Cost:200000 TrunkPort:no
Root: Mac 0000.0000.0000 Priority 0 ExternalPathCost 0
RegionalRoot: Mac 0000.0000.0000 Priority 0 InternalPathCost 0
DesignatedBridge: Mac 0000.0000.0000 Priority 0 DesignatedPort 0
Port 8 :
State:discarding Role:disabled Priority:128 Cost:200000 TrunkPort:no
Root: Mac 0000.0000.0000 Priority 0 ExternalPathCost 0
RegionalRoot: Mac 0000.0000.0000 Priority 0 InternalPathCost 0
DesignatedBridge: Mac 0000.0000.0000 Priority 0 DesignatedPort 0
Port 9 :
State:discarding Role:disabled Priority:128 Cost:200000 TrunkPort:no
Root: Mac 0000.0000.0000 Priority 0 ExternalPathCost 0
RegionalRoot: Mac 0000.0000.0000 Priority 0 InternalPathCost 0
DesignatedBridge: Mac 0000.0000.0000 Priority 0 DesignatedPort 0
Port 10 :
State:discarding Role:disabled Priority:128 Cost:200000 TrunkPort:no
Root: Mac 0000.0000.0000 Priority 0 ExternalPathCost 0
RegionalRoot: Mac 0000.0000.0000 Priority 0 InternalPathCost 0
DesignatedBridge: Mac 0000.0000.0000 Priority 0 DesignatedPort 0
Port 11 :
State:discarding Role:disabled Priority:128 Cost:200000 TrunkPort:no
Root: Mac 0000.0000.0000 Priority 0 ExternalPathCost 0
RegionalRoot: Mac 0000.0000.0000 Priority 0 InternalPathCost 0
DesignatedBridge: Mac 0000.0000.0000 Priority 0 DesignatedPort 0
Port 12 :
State:discarding Role:disabled Priority:128 Cost:200000 TrunkPort:no
Root: Mac 0000.0000.0000 Priority 0 ExternalPathCost 0
RegionalRoot: Mac 0000.0000.0000 Priority 0 InternalPathCost 0
DesignatedBridge: Mac 0000.0000.0000 Priority 0 DesignatedPort 0

Port 13 :

State:discarding Role:disabled Priority:128 Cost:200000 TrunkPort:no

Root: Mac 0000.0000.0000 Priority 0 ExternalPathCost 0

RegionalRoot: Mac 0000.0000.0000 Priority 0 InternalPathCost 0

DesignatedBridge: Mac 0000.0000.0000 Priority 0 DesignatedPort 0

Port 14 :

State:discarding Role:disabled Priority:128 Cost:200000 TrunkPort:no

Root: Mac 0000.0000.0000 Priority 0 ExternalPathCost 0

RegionalRoot: Mac 0000.0000.0000 Priority 0 InternalPathCost 0

DesignatedBridge: Mac 0000.0000.0000 Priority 0 DesignatedPort 0

Port 15 :

State:discarding Role:disabled Priority:128 Cost:200000 TrunkPort:no

Root: Mac 0000.0000.0000 Priority 0 ExternalPathCost 0

RegionalRoot: Mac 0000.0000.0000 Priority 0 InternalPathCost 0

DesignatedBridge: Mac 0000.0000.0000 Priority 0 DesignatedPort 0

Port 16 :

State:discarding Role:disabled Priority:128 Cost:200000 TrunkPort:no

Root: Mac 0000.0000.0000 Priority 0 ExternalPathCost 0

RegionalRoot: Mac 0000.0000.0000 Priority 0 InternalPathCost 0

DesignatedBridge: Mac 0000.0000.0000 Priority 0 DesignatedPort 0

Port 17 :

State:discarding Role:disabled Priority:128 Cost:200000 TrunkPort:no

Root: Mac 0000.0000.0000 Priority 0 ExternalPathCost 0

RegionalRoot: Mac 0000.0000.0000 Priority 0 InternalPathCost 0

DesignatedBridge: Mac 0000.0000.0000 Priority 0 DesignatedPort 0

Port 18 :

State:discarding Role:disabled Priority:128 Cost:200000 TrunkPort:no

Root: Mac 0000.0000.0000 Priority 0 ExternalPathCost 0

RegionalRoot: Mac 0000.0000.0000 Priority 0 InternalPathCost 0

DesignatedBridge: Mac 0000.0000.0000 Priority 0 DesignatedPort 0

Port 19 :

State:discarding Role:disabled Priority:128 Cost:200000 TrunkPort:no

Root: Mac 0000.0000.0000 Priority 0 ExternalPathCost 0

RegionalRoot: Mac 0000.0000.0000 Priority 0 InternalPathCost 0

DesignatedBridge: Mac 0000.0000.0000 Priority 0 DesignatedPort 0

Port 20 :

State:discarding Role:disabled Priority:128 Cost:200000 TrunkPort:no

Root: Mac 0000.0000.0000 Priority 0 ExternalPathCost 0

RegionalRoot: Mac 0000.0000.0000 Priority 0 InternalPathCost 0

DesignatedBridge: Mac 0000.0000.0000 Priority 0 DesignatedPort 0

Port 21 :

State:discarding Role:disabled Priority:128 Cost:200000 TrunkPort:no

Root: Mac 0000.0000.0000 Priority 0 ExternalPathCost 0

RegionalRoot: Mac 0000.0000.0000 Priority 0 InternalPathCost 0

DesignatedBridge: Mac 0000.0000.0000 Priority 0 DesignatedPort 0

Port 22 :

State:discarding Role:disabled Priority:128 Cost:200000 TrunkPort:no

Root: Mac 0000.0000.0000 Priority 0 ExternalPathCost 0

RegionalRoot: Mac 0000.0000.0000 Priority 0 InternalPathCost 0

DesignatedBridge: Mac 0000.0000.0000 Priority 0 DesignatedPort 0

Port 23 :

State:discarding Role:disabled Priority:128 Cost:200000 TrunkPort:no

Root: Mac 0000.0000.0000 Priority 0 ExternalPathCost 0

RegionalRoot: Mac 0000.0000.0000 Priority 0 InternalPathCost 0

DesignatedBridge: Mac 0000.0000.0000 Priority 0 DesignatedPort 0

Port 24 :

State:discarding Role:disabled Priority:128 Cost:200000 TrunkPort:no

Root: Mac 0000.0000.0000 Priority 0 ExternalPathCost 0

RegionalRoot: Mac 0000.0000.0000 Priority 0 InternalPathCost 0

DesignatedBridge: Mac 0000.0000.0000 Priority 0 DesignatedPort 0

Port 25 :

State:discarding Role:disabled Priority:128 Cost:200000 TrunkPort:no

Root: Mac 0000.0000.0000 Priority 0 ExternalPathCost 0

RegionalRoot: Mac 0000.0000.0000 Priority 0 InternalPathCost 0

DesignatedBridge: Mac 0000.0000.0000 Priority 0 DesignatedPort 0

Port 26 :

State:discarding Role:disabled Priority:128 Cost:200000 TrunkPort:no

Root: Mac 0000.0000.0000 Priority 0 ExternalPathCost 0

```

RegionalRoot: Mac 0000.0000.0000  Priority 0  InternalPathCost 0
DesignatedBridge: Mac 0000.0000.0000  Priority 0  DesignatedPort 0
Port 27 :
State:forwarding  Role:root  Priority:128  Cost:200000  TrunkPort:no
Root: Mac 000E.83E3.7580  Priority 4096  ExternalPathCost 0
RegionalRoot: Mac 000E.83E3.7580  Priority 4096  InternalPathCost 0
DesignatedBridge: Mac 000E.83E3.7580  Priority 4096  DesignatedPort 32769
Port 28 :
State:discarding  Role:alternate  Priority:128  Cost:200000  TrunkPort:no
Root: Mac 000E.83E3.7580  Priority 4096  ExternalPathCost 0
RegionalRoot: Mac 000E.83E3.7580  Priority 4096  InternalPathCost 0
DesignatedBridge: Mac 000E.83E3.7580  Priority 4096  DesignatedPort 32770

```

13.5.5 Show the basic information of multi-spanning tree instance port list

- Command: **show spanning-tree [instance instance-id] port-list [portlist]**
- Function: show all the spanning tree instances or the given spanning tree instance and the port basic information of the instance. Without the parameter **instance** instruction, all the instances and instance port information will be shown.
- Show the result:

```

Raisecom# show spanning-tree port-list 27
Port ID:27
EdgedPort:  admin: auto    oper: no
LinkType:   admin: auto    oper: point-to-point
Partner MSTP Mode: mstp
Bpdus send:209  (TCN<0>  Config<0>  RST<0>  MST<209>)
Bpdus received:212  (TCN<0>  Config<0>  RST<212>  MST<0>)
Instance PortState  PortRole  PortCost(admin/oper) PortPriority
-----
0      forwarding      root      200000/200000      128
3      forwarding designated  200000/200000      128

```

13.5.6 Show the detail of multi-spanning tree instance port list

- Command: **show spanning-tree [instance instance-id] detail**
- Function: show all the spanning tree instances or the given spanning tree and the detail of the instance port. Without the parameter **instance**, all the instances and the detail of the instance port.
- Show the result:


```

Raisecom# show spanning-tree port-list 28 detail

Port ID:28

EdgedPort:  admin: auto    oper: no

LinkType:   admin: auto    oper: point-to-point

Partner MSTP Mode: mstp

Bpdus send:241  (TCN<0>  Config<0>  RST<0>  MST<241>)

Bpdus received:243 (TCN<0>  Config<0>  RST<0>  MST<243>)

This port In mst0 Info:

State:discarding  Role:alternate  Priority:128  Cost: 200000

Root: Mac 000E.83E3.7580  Priority 4096  ExternalPathCost 0

RegionalRoot: Mac 000E.83E3.7580  Priority 4096  InternalPathCost 0

DesignatedBridge: Mac 000E.83E3.7580  Priority 4096  DesignatedPort 32770

This port In mst3 Info:

State:forwarding  Role:designated  Priority:128  Cost: 200000

RegionalRoot: Mac 000E.5E00.1864  Priority 32768  InternalPathCost 0

DesignatedBridge: Mac 000E.5E00.1864  Priority 32768  DesignatedPort 32796

```

13.6 Typical configuration instance

➤ Destination:

Set sw1, sw2, sw3 to the same MST domain MST1, modification class to 2, and map VLAN1 to instance 1, VLAN2 to instance 2, other VLAN to CIST;

Set MST2, MST3 to contain sw4/sw6/sw7, sw5/sw8/sw9, the correspondence that VLAN map to instance is similar to MST1.

Show the final spanning tree voting, configure the CIST that take sw3/sw4/sw5 as switch.

➤ Network figure

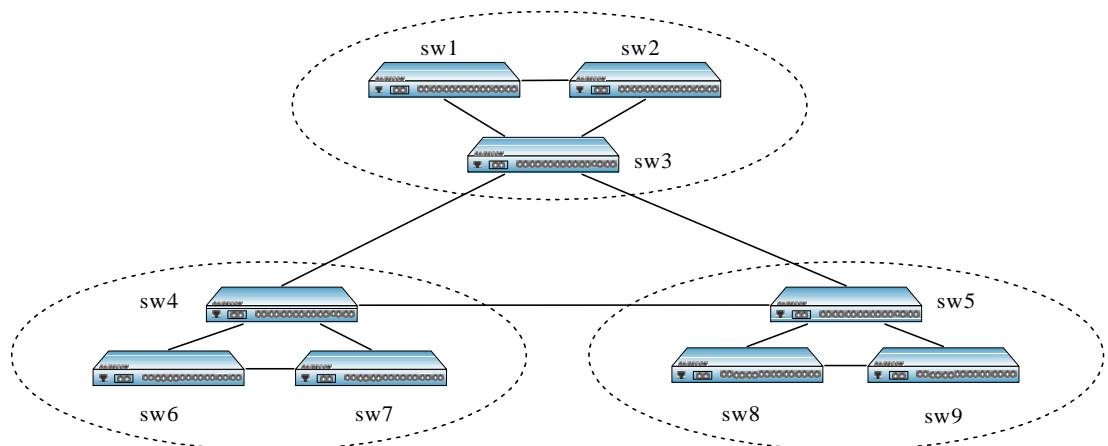


Fig 13-3 network figure

➤ Configuration step:

Step 1:

Configure MST domain configuration information, the domain name is MST, modification class is 2, map VLAN2 to instance 2, others to CIST, and enable the configuration information

```
Raisecom#config
Raisecom(config)#spanning-tree region-configuration
Raisecom(config-region)#name MST1
Raisecom(config-region)#revision-level 2
Raisecom(config-region)#instance 1 vlan 1
Raisecom(config-region)#instance 2 vlan 2
Raisecom(config-region)#exit
Raisecom(config)#spanning-tree region-configuration active
```

Step 2:

Configure MST2 and MST3 in the same way.

Step 3:

To look over the spanning tree configuration information, instance 1 information:

```
Raisecom#show spanning-tree region-configuration
Raisecom#show spanning-tree instance 1
```

MST1, MST2, MST3 form as complete single spanning tree.

Step 4:

Set the electric physical port on MST1, MST2, MST3 domain to the member port of VLAN1;

In MST1 domain configure the bridge priority of sw3 to 4096, the priority of other switches larger than 4096;

In MST2 domain configure the bridge priority of sw4 to 8192, the priority of other switches larger than 8192;

In MST2 domain configure the bridge priority of sw5 to 8192, the priority of other switches larger than 8192;

In each domain, the topology will vote and create single spanning tree according to STP/RSTP, and create a final tree, the root of which is sw3, and the connection between sw4 and sw5 will be stopped.

There is only one MST1 in MST1/MST2/MST3 domain, sw3/sw4/sw5 is thought to be root, the topology picture is as follows:

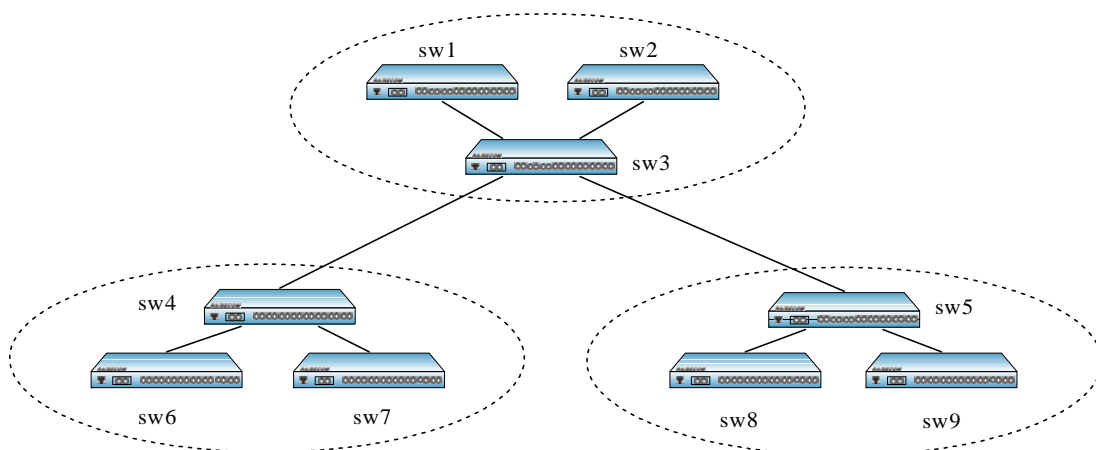


Fig 13-4 topology figure



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