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MAC Address Table Management Guide
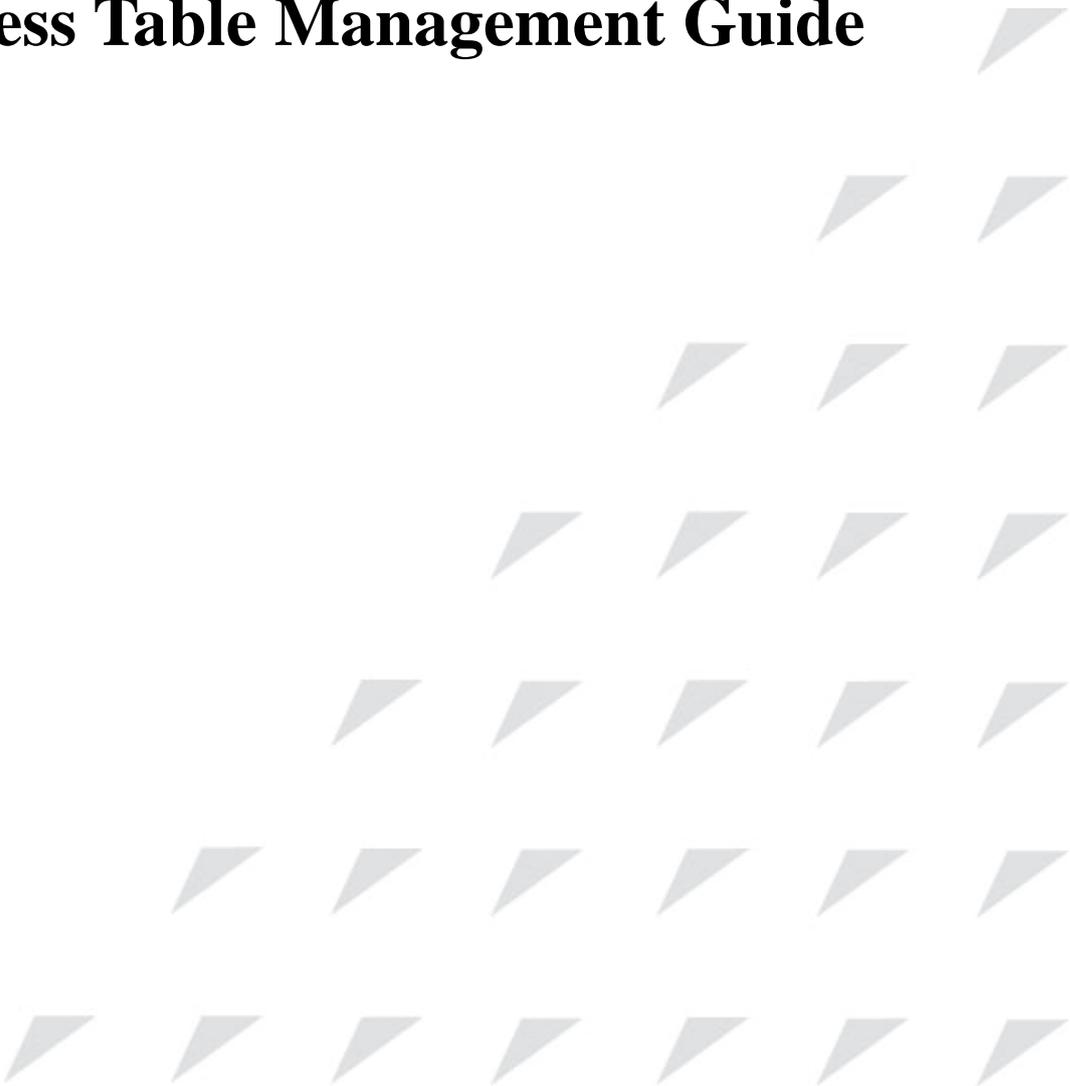
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If you have comments on the … specification, instead of the web page above, please send comments to:

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We hope to hear from you!

CONTENTS

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 MAC Address Transmission Table Management

1.1 MAC transmission table management introduction

1.1.1 MAC address transmission table

The Ethernet switch's main function is to transmit message in data link layer,   that is to transmit messages to the corresponding port according to the destination MAC address. MAC address transmission table is a two-ply table that contains MAC address and transmission port matchup, which is the base of the Ethernet switch transmitting two-ply messages.

MAC address transmission table contains the following information:

➢   The destination MAC address;

➢   The VLAN ID belongs to the port;

➢   The transmission egress port number of the local equipment;

When the Ethernet switch is transmitting messages, according to the MAC address table information, the following way is available:

➢   Unicast: when there is table item that fits the message destination MAC address in the MAC address transmission table, the switch will transmit it directly from the transmission egress port of the table item;

➢   Broadcast: when the messages that the switch received from the destination address are all F, or when there is no table item that is accord with the message destination MAC address in the MAC address transmission table, the switch will use broadcast and transmit the message to all the ports except the receive ports.

1.1.2 MAC address learning

The table item in MAC address table can be upgraded and maintained through the following two ways:

➢   Manual configuration

➢   MAC address learning

Usually, most MAC address is created and maintained by the MAC address function. The Ethernet switch learning MAC address process is shown below:
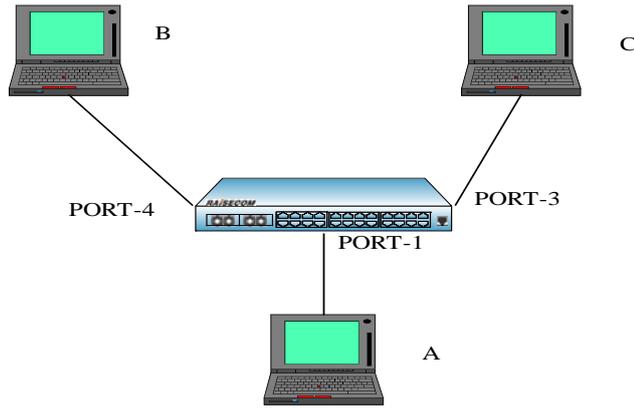
Fig 1 Mac address learning

When UserA need to communicate with UserB in the same VLAN1, the message need to be sent to the switch's port 1, while the switch record the message's source MAC address, or UserA's address 'MAC-A', to its own MAC address transmission table.

When the learning process is done, the switch will transmit the message. Because there is no MAC address and port table item, the switch will transmit the message to all the port except port 1 to confirm that UserB could receive the message;

Because the switch use broadcast to transmit the message, both UserB and UserC will receive the message, while UserC is not the destination equipment, so he will not process it. Normally, UserB will respond UserA by sending messages. When the response message is sent to port 4, the switch will use the same MAC address learning way and save UserB's address and port corresponding relationship in the MAC address transmission table.

By this time there will be two table item in the switch's transmission table. When transmitting response message, because there has already been the table item that the destination is 'MAC-A' in the MAC address transmission table, the switch will no longer use broadcast, but send the message directly to UserA through port 1 to accomplish the message interaction.

The way above is independent MAC address learning, or IVL, while there is another way for learning MAC address, that is share-VLAN MAC address learning, or SVL. By default, the switch use IVL mode, and SVL mode needs to be set in some cases.

1.1.3 MAC address table management

1 MAC address transmission table aging mechanism:

The switch MAC address transmission table has limitation in capacity, so it use aging mechanism to refresh the MAC address transmission table to make full use of the address transmission table resource. That is, the system open the aging timer when it is creating one table item dynamically, and if there is no more messages received from the MAC address of the table item in the aging time, the switch will delete the MAC address table item.

Notice:

➢ When 'destination MAC address refresh' function is enabled, if the switch transmits a message which the destination is one MAC address in the aging time, the MAC table item will be refreshed, and restart aging;

➢ MAC address aging mechanism is valid only to dynamic MAC address table item.

2 MAC address table sorts and features:

> ➢ Static MAC address table item: or 'permanent address', it is added or deleted by user, without aging. For a network in which the equipments change rarely, manually adding static address table item can reduce the network broadcast traffic.

> ➢ Dynamic MAC address table item: it stands for the MAC address table item that ages according to the aging time that user set. The switch could add dynamic MAC address table item through MAC address learning mechanism or user handwork.

1.2 MAC address transmission table management configuration

1.2.1 The default MAC address transmission table configuration

Function	Default value
MAC address aging time	300s
MAC address learning feature	Enable
Static MAC address privilege	-1（N/A in command lines）
Static MAC address MAC strategy	Transmit normally
Static MAC address no-speed-limit	enable

1.2.2 Static MAC address configuration

Step	Command	Description
1	config	Enter global configuration mode
2	mac-address-table static unicast *HHHH.HHHH.HHHH* vlan *vlan_id* port *port-number*	Set the static MAC address. *HHHH.HHHH.HH*HH is the static MAC address which will be set; format is hex, dotted notation for every four characters. Vlan_id range is 1-4094. *port_number* is the physical port number.
3	mac-address-table static multicast *HHHH.HHHH.HHHH* vlan *vlan_id* port *port-list*	Set the static MAC address. *HHHH.HHHH.HHHH is the static MAC address which will be set; format is hex,* dotted notation for every four characters. Vlan_id range is 1-4094. *port_number* is the physical port number,

		range is 1-26, use ',' or '-' to input the port list.
4	exit	Exit global configuration mode and enter privileged EXEC mode
5	show mac-address-table static [port *port-number* | vlan *vlan_id*]	Show (port or VLAN) static address. *port_number* is physical port, range is 1-26. *vlan_id:* range is 1-4094.

⚠ Notice:

➢ The switch MAC address, multicasting address, FFFF.FFFF.FFFF and 0000.0000.0000 can not be configured as the static MAC address;

1.2.3 MAC address aging time configuration

The dynamic source MAC address that the switch has learned will age when it is not in use. The aging time can be changed, and the MAC address aging can be disabled. By default, the aging time is 300s.

Step	Command	Description
1	**config**	Enter global configuration mode
2	**mac-address-table aging-time** { *0* | *time* }	Set the aging time of MAC address table. 0 stands for MAC address will not be aged *time* is the target MAC address aging time, unit is second, range is 3-765, and default value is 300.
3	**exit**	Quit global configuration mode and enter privileged EXEC mode
4	**show mac aging-time**	Show MAC address aging time

To restore the default value, use the command **no: no mac-address-table aging-time**.

1.2.4 MAC address learning enable/disable

Sometimes disable/enable a certain physical port learning MAC address is needed, which can be achieved by configuring the switch of MAC address learning ability. By default, every physical port can be allowed to learn MAC address.

Step	Command	Description

1	**config**	Enter global configuration mode.
2	**mac-address-table learning** {**enable** | **disable**} **port-list** {**all** | {1-26}}	Enable or disable the MAC address learning function of physical port. **enable** enable MAC address learning function. **disable** disable MAC address learning function. *MAX_PORT_NUM* the maximum port number that the equipment support
3	**exit**	Exit from global configuration mode to privileged EXEC mode.
4	**show interface port** [*port-number*]	Show port status. *port_number physical port*,range is 1-26.

1.2.5 Clear MAC address table

Clear layer-2 MAC address table entries of the switch, includes static and dynamic MAC address. The command can be used in global configuration mode.

Step	Command	Description
1	**clear mac-address-table** {**all** | **dynamic** | **static**}	**all:** delete all the 2 MAC addresses in the MAC address table **dynamic:** delete dynamic MAC addresses in the MAC address table **static:** delete static MAC addresses in the MAC address table

1.2.6 Configure static MAC address privilege

The static MAC address privilege value range is 0~7, the default value is -1, and the command line shows N/A when it is -1.

The configuration step is shown below:

Step	Command	Description
1	config	Enter global configuration mode
2	**mac-address-table static unicast** *HHHH.HHHH.HHHH* **vlan** *vlan_id* **port** *port-number* [**priority** *<0-7>*]	Set static MAC address *HHHH.HHHH.HHHH* is the static MAC address which will be set; format is hex, dotted notation for every four characters. *vlan_id* VLAN ID, range is 1~4094. *port_number* physical port number configure the privilege value, range is 0~7
3	**exit**	Quit global configuration mode and enter privileged EXEC mode.
4	**show mac-address-table static** [**port** *port-number*	**vlan** *vlan_id*]	Show (port or VLAN) static address *port_number* physical port number *vlan_id* VLAN ID, range is 1~4094.

To restore static MAC address default privilege (-1), use **no: no mac-address-table static unicast** HHHH.HHHH.HHHH **vlan** vlan id **priority.**

1.2.7 enable/disable static MAC strategy

Static MAC address MAC strategy includes normal transmission (default), mirror and drop, all of which are based on port. This command enable global switches.

The step is shown below:

Step	Command	Description
1	config	Enter global configuration mode
2	**mac-address-table static unicast** *HHHH.HHHH.HHHH* **vlan** *vlan_id* **port** *port-number* [**mac-policy**]	Set static MAC configuration *HHHH.HHHH.HHHH* static MAC address which is to be set, format is hex, dotted notation for every four characters. *vlan_id* VLAN ID, range is 1~4094. *port_number* physical port number **mac-policy** enable MAC strategy.

| 3 | **exit** | Quit global configuration mode and enter privileged EXEC mode. |
| 4 | **show mac-address-table static** [**port** *port-number* \| **vlan** *vlan_id*] | Show (port or VLAN) static address

port_number physical port number

vlan_id VLAN ID, range is 1~4094. |

To close static MAC address MAC strategy default configuration, use **no: no mac-addresss-table static unicast** HHHH.HHHH.HHHH **vlan** vlan id **mac-policy.**

1.2.8 Enable/disable static MAC address non-rate-limit

Static MAC address can be set non-rat-limit. To the given MAC address, with non-speed-limit configuration, the messages into the MAC address have no speed limit.

Step	Command	Description
1	config	Enter global configuration mode
2	**mac-address-table static unicast** *HHHH.HHHH.HHHH* **vlan** *vlan_id* **port** *port-number* **[non-rate-limit]**	Set static MAC configuration *HHHH.HHHH.HHHH* static MAC address which is to be set, format is hex, dotted notation for every four characters. *vlan_id* VLAN ID, range is 1~4094. *port_number* physical port number **non-rate-limit** non-rate-limit feature
3	**exit**	Quit global configuration mode and enter privileged EXEC mode
4	**show mac-address-table static** [**port** *port-number* | **vlan** *vlan_id*]	Show (port or VLAN) static address *port_number* physical port number *vlan_id* VLAN ID, range is 1~4094.

To close static MAC address non-rate-limit, use **no: no mac-address-table static unicast**

HHHH.HHHH.HHHH.HHHH **vlan** vlan_id **non-rate-limit**

1.2.9 Monitoring and maintaining

Use **show** to look over MAC address transmission table configuration:

Command	Description
show mac aging-time	Show MAC address aging time
show mac-address-table l2-address port *port-number*	Show the switch port MAC address *Port_number* physical port, range is 1~26
show mac-address-table l2-address vlan *vlan_id*	Show the switch port MAC address *vlan_id* VLAN ID, range is 1~4094
show mac-address-table l2-address count port *port-number*	Show the switch port MAC address number Count stands for the MAC address number related to the statistics *port_number* physical port number, range is 1~26.
show mac-address-table l2-address count vlan *vlan_id*	Show the switch VLAN MAC address Count stands for the MAC address number related to the statistics *vlan_id* VLAN ID, range is 1~4094
show mac-address-table static	Show the switch static MAC address configuration information
show mac-policy portlist *portlist*	Show the MAC strategy of each port

Especially, the command for searching the information of a certain MAC address in the switch.

Command	Description
search mac-address *HHHH.HHHH.HHHH*	Search for MAC address *HHHH.HHHH.HHHH* static MAC address which is to be set, format is hex, dotted notation for every four characters.

1.2.10 Typical configuration example

➤   Destination:

Enable all the ports' MAC address learning function of the switch;

Configure a static unicast MAC address 1234.1234.1234 in port 2, VLAN 10;

Set the aging time 100s, observe the switch MAC address learning and aging situation.

➤   Network figure
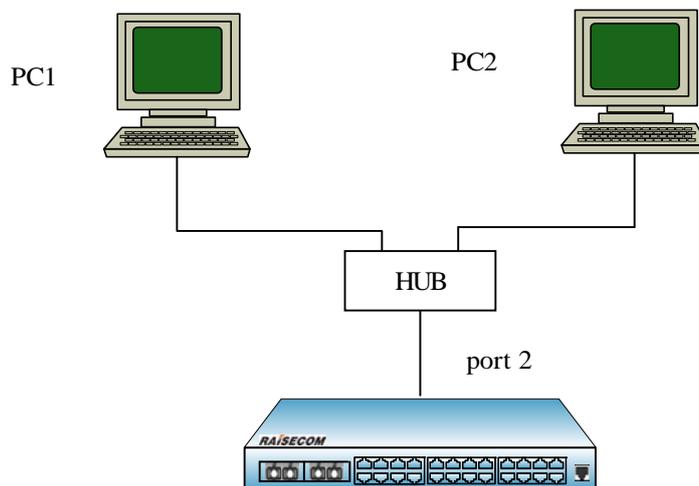
Fig 2   network

➤   Configuration step

Step 1:

Enable all the ports' MAC address learning function

Raisecom(config)#mac-address-table learning enable port-list all

Step 2:

Set static unicast MAC address 1234.1234.1234.1234 in port 2, VLAN 10

Raisecom(config)#interface port 2

Raisecom(config-port)#switchport access vlan 10

Raisecom(config)#mac-address-table static unicast 1234.1234.1234 vlan 10 port 2

Step 3:

Set the aging time as 100s

Raisecom(config)#mac-address-table aging-time 100

We can notice that the switch can learn 2 dynamic MAC address through port 2, which age 100s later, then restart learning, while static MAC address will no age.

1.3 MAC address number limit

With MAC address learning function, the Ethernet switch can get the MAC address within the same network segment. To the message that is sent to the MAC addresses, the Ethernet switch use hardware for transmission through looking for MAC address transmission table to raise the transmission efficiency. If the MAC address transmission table is much too large, the time of looking for the corresponding transmission table item may be prolonged, and the switch transmission function will drop. By configuring the maximum MAC address number that the Ethernet port can learn, the administrator is able to control the MAC address transmission table item number that the Ethernet switch maintains. When the MAC address number that the port has learned rises to the maximum value that user set, the port will no longer learn MAC address.

1.3.1 Configure the default MAC address number limit

By default, the MAC address learning number has no upper limit.

1.3.2 Configure the MAC address number

Step	Command	Description
1	config	Enter global configuration mode
2	**interface { port	line	client}** *<1- MAX_PORT_NUM >*	Enter Ethernet physical port mode
3	**mac-address-table threshold** *< PORT_MAC_MIN_THRESHOLD_STR - PORT_MAC_MAX_THRESHOLD_STR>*	Configure the MAC address learning upper limit *PORT_MAC_MIN_THRESHOLD_STR* value upper limit *PORT_MAC_MAX_THRESHOLD_STR* value lower limit
4	**exit**	Quit global configuration mode and enter privileged EXEC mode
5	**show interface mac-address-table threshold**	Show interface mac address table threshold value

1.3.3 Monitoring and maintaining

Command	Description
show interface	Show interface MAC address table threshold

```
mac-address-table threshold    value
Show mac-addres l2             Show interface MAC address number that has
                               been learned
```

1.3.4 Typical configuration example

➢ Destination

Configure the MAC address learning threshold of the switch port as 1, and the switch won't learn the dynamic MAC address that extend the threshold value.

➢ Network
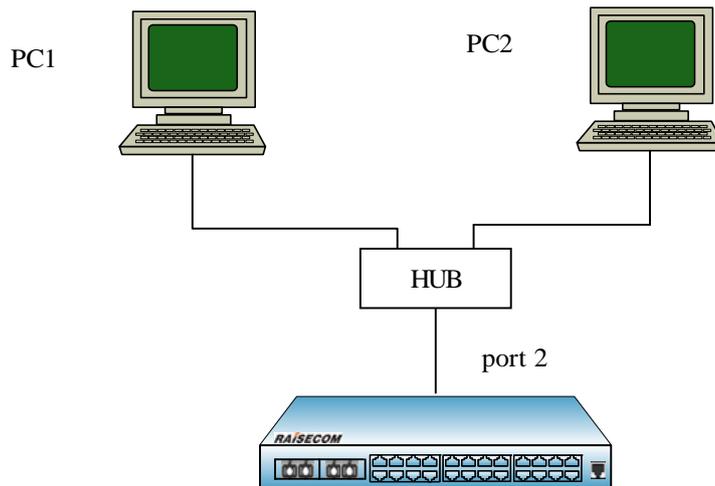
Fig 3   network

➢ Configuration step

Step 1:

The upper limit of port 2 learning MAC address is 100

Raisecom(config-port)#mac-address-table threshold 1

Step 2:

Show interface MAC address learning number:

Raisecom# show mac-address-table l2-address count port 1

Port 2 shows only 1 dynamic MAC is learned.

Step 3:

Cancel the MAC learning confirmation of port 2

Raisecom(config-port)#no mac-address-table threshold

Show interface MAC address learning number:

Raisecom# show mac-address-table l2-address count port 1

Port 2 shows there are 2 dynamic MAC that has been learned.

1.4 Shared VLAN learning function

1.4.1 The default SVL configuration

Function	Default value
SVL feature	Disabled
Interface SVL default VLAN list	Empty
SVL default VLAN	VLAN 1

1.4.2 SVL configuration

The step is shown below:

Step	Command	Description
1	config	Enter global configuration mode
2	**svl** { **enable** | **disable** }	Enable/disable SVL mode
3	**interface port** *<1-MAX_PORT_NUM>*	Enter port configuration mode *1-MAX_PORT_NUM* the port number that the equipment supports
4	**switchport svl vlanlist** {*1-4094*}	Optical Set the shared VLAN list of the port
5	**exit**	Enter global configuration mode
6	**svl default vlan** *<1-4094>*	Set SVL default VLAN *1-4094*:VLAN ID
7	**exit**	Quit global configuration mode and enter privileged EXEC mode
8	**show svl**	Show SVL state
9	show switchport [*<1-MAX_PORT_NUM>*] svl vlanlist	Show interface shared VLAN list *1-MAX_PORT_NUM* the port number that the equipment supports
10	**show svl default vlan**	Show SVL default VLAN

⚠Notice：

When some port is not configured the SVL VLAN list, the MAC will be shared to SVL default

VLAN;

1.4.3 Monitoring and maintaining

Command	Description
Show svl	Show SVL state
show switchport **[<*1-MAX_PORT_NUM*>] svl vlanlist**	Show interface shared VLAN list *1-MAX_PORT_NUM* the port number that the equipment supports
Show svl default vlan	Show SVL default VLAN

1.4.4 Typical configuration example

➢ Destination

Enable the switch SVL function, and share the MAC address learned in port 1 between VLAN 1-4;

➢ Configuration step

Step 1:

Enable SVL mode

Raisecom # **config**

Raisecom (config)# **svl** enable

Raisecom (config)# **exit**

Raisecom # **show svl**

SVL: Enable

Step 2:

Set port 1 shared VLAN 1-4

Raisecom#**config**

Raisecom(config)#**interface port** 1

Raisecom(config-port)# **switchport svl vlanlist 1-4**

Raisecom(config-port)#**exit**

Raisecom(config)#**exit**

Raisecom# **show switchport 1 svl vlanlist**

　　Port　　SVL　　VLAN list

　　1　　　　　　1-4