CHAPTER 11

Configuring Auto Smartports Macros

This chapter describes how to configure and apply Auto Smartports and static Smartports macros on the Catalyst 2960 switch.

Note For complete syntax and usage information for the commands used in this chapter, see the command reference

Understanding Auto Smartports and Static Smartports Macros

Auto Smartports macros dynamically configure ports based on the device type detected on the port. When the switch detects a new device on a port it applies the appropriate Auto Smartports macro on the port. When there is a link-down event on the port, the switch removes the macro. For example, when you connect a Cisco IP phone to a port, Auto Smartports automatically applies the IP phone macro. The IP phone macro enables quality of service (QoS), security features, and a dedicated voice VLAN to ensure proper treatment of delay-sensitive voice traffic.

In addition to Auto Smartports macros, static Smartports macros provide port configuration that you manually apply based on the device connected to the port. When you apply a static Smartports macro the CLI commands within the macro are added to the existing port configuration. When there is a link-down event on the port, the switch does not remove the static macro.

Auto Smartports uses event triggers to map devices to macros. The most common event triggers are based on Cisco Discovery Protocol (CDP) messages received from connected devices. The detection of a device invokes a CDP event trigger: Cisco IP phone, Cisco wireless access point, Cisco switch, or Cisco router. Other event triggers use MAC authentication bypass (MAB) and 802.1x authentication messages.

The Auto Smartports macros embedded in the switch software are groups of CLI commands. The CISCO_PHONE event detected on a port triggers the switch to apply the commands in the CISCO_PHONE_AUTO_SMARTPORT macro. You can also create user-defined macros by using the Cisco IOS scripting capability, which is a BASH-like language syntax for command automation and variable replacement.

Configuring Auto Smartports

Default Auto Smartports Configuration

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Table 11-1 Auto Smartports Built-in Macros

Macro Name	Description
CISCO_DOT1X_DESKTOP_ AUTO_SMARTPORT	Use this macro to apply the desktop macro for IEEE 802.1x-authenticated devices. It enables basic desktop configuration, including security and spanning-tree protection.
CISCO_DOT1X_EASY_AUTO _SMARTPORT	Use this macro to apply the desktop macro for IEEE 802.1x-authenticated desktop devices. It provides 802.1x, MAB, guest-VLAN, authentication-fail-VLAN support and reduces the 802.1x timeout to 3 seconds.
CISCO_DOT1X_MAB_ GUEST_AUTO_SMARTPORT	Use this macro to apply the desktop macro for 802.1x-, MAB-, and guest-VLAN-authenticated devices.
CISCO_DOT1X_MAB_ TIMEOUT_AUTO_ SMARTPORT	Use this macro to apply the desktop macro for 802.1x-, MAB-, and guest-VLAN-authenticated devices configured with an aggressive timeout.
CISCO_DOT1X_AUTH_ FAIL_AUTO_SMARTPORT	Use this macro to apply the desktop macro for 802.1x-, MAB-, and authentication-fail-VLAN-authenticated devices.
CISCO_DOT1X_CRITICAL_ AUTO_SMARTPORT	Use this macro to apply the desktop macro for 802.1x-, MAB-, and critical-VLAN-authenticated devices.

Auto Smartports Configuration Guidelines

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show shell *functions*

auto-smart-port=*event trigger*

cdp-fallback

macro auto global processing

Enabling Auto Smartports

	Command	Purpose
Step 1		
Step 2	[ ]	Globally enable Auto Smartports on the switch. (Optional) Use the keyword to enable the switch to use CDP capability information when a port is 802.1x-enabled and the RADIUS server does not send an event trigger.
Step 3		
Step 4		
Step 5	**copy running-config startup-config**	

```
Switch(config)# macro auto global processing
                interface interface_id
Switch(config-if)#
```

Configuring Auto Smartports Built-in Macros

	Command	Purpose
Step 1		

Step 2	**macro auto execute** **builtin** *built-in macro name* *parameter=value parameter=value*	*event trigger* —Apply a user-defined event trigger. Specify a *built-in macro name*: CISCO_PHONE_AUTO_SMARTPORT (Optional) Specify the parameter values: $ACCESS_VLAN=(1) and $VOICE_VLAN=(2). CISCO_SWITCH_AUTO_SMARTPORT (Optional) Specify the parameter values: $NATIVE_VLAN=(1). CISCO_ROUTER_AUTO_SMARTPORT (Optional) Specify the parameter values: $NATIVE_VLAN=(1). CISCO_AP_AUTO_SMARTPORT (Optional) Specify the parameter values: $NATIVE_VLAN=(1). CISCO_LWAP_AUTO_SMARTPORT (Optional) Specify the parameter values: $ACCESS_VLAN=(1). CISCO_DOT1X_DESKTOP_AUTO_SMARTPORT (Optional) Specify the parameter values: $ACCESS_VLAN=(1). CISCO_DOT1X_EASY_AUTO_SMARTPORT (Optional) Specify the parameter values: $ACCESS_VLAN=(1). CISCO_DOT1X_MAB_GUEST_AUTO_SMARTPORT (Optional) Specify the parameter values: $ACCESS_VLAN=(1). CISCO_DOT1X_MAB_TIMEOUT_AUTO_SMARTPORT (Optional) Specify the parameter values: $ACCESS_VLAN=(1). CISCO_DOT1X_AUTH_FAIL_AUTO_SMARTPORT (Optional) Specify the parameter values: $ACCESS_VLAN=(1). CISCO_DOT1X_CRITICAL_AUTO_SMARTPORT (Optional) Specify the parameter values: $CRITICAL_VLAN=(1). (Optional) —Replace default values that begin with **$** [<name1>=<value1> <name2>=<value2>...]. Default values are shown in parenthesis.
		Return to privileged EXEC mode.
		Verify your entries.
		(Optional) Save your entries in the configuration file.

This example shows how to use two built-in Auto Smartports macros for connecting Cisco switches and Cisco IP phones to the switch. This example modifies the default voice VLAN, access VLAN, and native VLAN for the trunk interface:

```
                !!! the next command modifies the access and voice vlans
                !!! for the built in Cisco IP phone auto smartport macro
                 macro auto execute CISCO_PHONE_EVENT builtin CISCO_PHONE_AUTO_SMARTPORT
ACCESS_VLAN=10 VOICE_VLAN=20

                !!! the next command modifies the Native vlan used for inter switch trunks
                 macro auto execute CISCO_SWITCH_EVENT builtin CISCO_SWITCH_AUTO_SMARTPORT
NATIVE_VLAN=10

                !!! the next command enables auto smart ports globally
                 macro auto global processing cdp-fallback

                 exit

        !!! here's the running configuration of the interface connected
        !!! to another Cisco Switch after the Macro is applied

        show running-config interface Gi1/0/1
Building configuration...

Current configuration : 284 bytes
!
interface GigabitEthernet1/0/1
 switchport trunk encapsulation dot1q
 switchport trunk native vlan 10
 switchport mode trunk
 srr-queue bandwidth share 10 10 60 20
 queue-set 2
 priority-queue out
 mls qos trust cos
 auto qos voip trust
 macro description CISCO_SWITCH_EVENT
end
```

Configuring Event Triggers

	Command	Purpose
Step 1		
Step 2	*identifier description*	

a.

b.

c.

d. The switch recognizes the attribute-value pair=RADIUS_MAB_EVENT response from the RADIUS server and applies the macro CISCO_DOT1X_MAB_GUEST_AUTO_SMARTPORT.

```
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#
Switch(config)#
Switch(config)#
Switch(config)# shell trigger RADIUS_MAB_EVENT MAC_AuthBypass Event

               !!! map a system defined macro to the trigger event
                macro auto execute RADIUS_MAB_EVENT builtin ?
  CISCO_DOT1X_DESKTOP_AUTO_SMARTPORT
  CISCO_DOT1X_EASY_AUTO_SMARTPORT
  CISCO_DOT1X_MAB_GUEST_AUTO_SMARTPORT
  CISCO_DOT1X_MAB_TIMEOUT_AUTO_SMARTPORT
  CISCO_DOT1X_AUTH_FAIL_AUTO_SMARTPORT
  CISCO_DOT1X_CRITICAL_AUTO_SMARTPORT
  CISCO_AP_AUTO_SMARTPORT
  CISCO_LWAP_AUTO_SMARTPORT
  CISCO_PHONE_AUTO_SMARTPORT
  CISCO_ROUTER_AUTO_SMARTPORT
  CISCO_SWITCH_AUTO_SMARTPORT
LINE    <cr>
Switch(config)#
CISCO_DOT1X_MAB_GUEST_AUTO_SMARTPORT ACCESS_VLAN=10
Switch(config)# exit
Switch# show shell triggers
User defined triggers
---------------------
Trigger Id: RADIUS_MAB_EVENT
Trigger description: MAC_AuthBypass Event
Trigger environment:
Trigger mapping function: CISCO_DOT1X_MAB_GUEST_AUTO_SMARTPORT
<output truncated>
```

```
Switch# show shell triggers

User defined triggers
---------------------
Built-in triggers
-----------------
Trigger Id: CISCO_PHONE_EVENT
Trigger description: Event for ip-phone macro
Trigger environment: ACCESS_VLAN=1 VOICE_VLAN=2
Trigger mapping function: CISCO_PHONE_AUTO_SMARTPORT
```

```
function CISCO_AP_AUTO_SMARTPORT () {
    if [[ $LINKUP -eq YES ]]; then
        conf t
            interface  $INTERFACE
                macro description $TRIGGER
                switchport trunk encapsulation dot1q
                switchport trunk native vlan $NATIVE_VLAN
                switchport trunk allowed vlan ALL
                switchport mode trunk
                switchport nonegotiate
                auto qos voip trust
                mls qos trust cos
            exit
        end
    fi
    if [[ $LINKUP -eq NO ]]; then
        conf t
            interface  $INTERFACE
                no macro description
                no switchport nonegotiate
                no switchport trunk native vlan $NATIVE_VLAN
                no switchport trunk allowed vlan ALL
                no auto qos voip trust
                no mls qos trust cos
                if [[ $AUTH_ENABLED -eq NO ]]; then
                    no switchport mode
                    no switchport trunk encapsulation
                fi
            exit
        end
    fi
}
```

```
function CISCO_SWITCH_AUTO_SMARTPORT () {
    if [[ $LINKUP -eq YES ]]; then
        conf t
            interface  $INTERFACE
                macro description $TRIGGER
                auto qos voip trust
                switchport trunk encapsulation dot1q
                switchport trunk native vlan $NATIVE_VLAN
                switchport trunk allowed vlan ALL
                switchport mode trunk
            exit
        end
    else
         conf t
             interface  $INTERFACE
                 no macro description
                 no auto qos voip trust
                 no switchport mode trunk
                 no switchport trunk encapsulation dot1q
                 no switchport trunk native vlan $NATIVE_VLAN
                 no switchport trunk allowed vlan ALL
             exit
         end
    fi
}

<output truncated>
```

Configuring Auto Smartports User-Defined Macros

	Command	Purpose
Step 1		
Step 2	{ }	{ } $
	end	
	show running-config	
	copy running-config startup-config	

```
               macro auto execute CISCO_DMP_EVENT {
if [[ $LINKUP -eq YES ]]; then
conf t
 interface $INTERFACE
   macro description $TRIGGER
   switchport access vlan 1
   switchport mode access
   switchport port-security
   switchport port-security maximum 1
   switchport port-security violation restrict
   switchport port-security aging time 2
   switchport port-security aging type inactivity
   spanning-tree portfast
   spanning-tree bpduguard enable
   exit
fi
if [[ $LINKUP -eq NO ]]; then
conf t
interface $INTERFACE
     no macro description $TRIGGER
     no switchport access vlan 1
     if [[ $AUTH_ENABLED -eq NO ]]; then
        no switchport mode access
     fi
     no switchport port-security
     no switchport port-security maximum 1
     no switchport port-security violation restrict
     no switchport port-security aging time 2
     no switchport port-security aging type inactivity
     no spanning-tree portfast
     no spanning-tree bpduguard enable
     exit
fi
}
               end
```

Table 11-2 Supported Cisco IOS Shell Keywords

{	Begin the command grouping.
}	End the command grouping.
[[	Use as a conditional construct.
]]	Use as a conditional construct.
else	Use as a conditional construct.
-eq	Use as a conditional construct.

Table 11-2 Supported Cisco IOS Shell Keywords (continued)

fi	Use as a conditional construct.
if	Use as a conditional construct.
then	Use as a conditional construct.
-z	Use as a conditional construct.
$	Variables that begin with the $ character are replaced with a parameter value.
#	Use the # character to enter comment text.

Table 11-3 Unsupported Cisco IOS Shell Reserved Keywords

|	Pipeline.
case	Conditional construct.
esac	Conditional construct.
for	Looping construct.
function	Shell function.
in	Conditional construct.
select	Conditional construct.
time	Pipeline.
until	Looping construct.
while	Looping construct.

This section describes how to configure and enable static Smartports macros.

Default Static Smartports Configuration, page 11-11

Static Smartports Configuration Guidelines, page 11-12

Applying Static Smartports Macros, page 11-12

There are no static Smartports macros enabled on the switch.

Table 11-4 Default Static Smartports Macros

[1]	
	Use this global configuration macro to enable rapid PVST+, loop guard, and dynamic port error recovery for link state failures.
	Use this interface configuration macro for increased network security and reliability when connecting a desktop device, such as a PC, to a switch port.
	Use this interface configuration macro when connecting a desktop device such as a PC with a Cisco IP Phone to a switch port. This macro is an extension of the macro and provides the same security and resiliency features, but with the addition of dedicated voice VLANs to ensure proper treatment of delay-sensitive voice traffic.
	Use this interface configuration macro when connecting an access switch and a distribution switch or between access switches connected by using small form-factor pluggable (SFP) modules.
	Use this interface configuration macro when connecting the switch and a WAN router.
	Use this interface configuration macro when connecting the switch and a wireless access point.

1. Cisco-default Smartports macros vary, depending on the software version running on your switch.

macro-name

macro-name

Applying Static Smartports Macros

	Display the Cisco-default static Smartports macros embedded in the switch software.
	Display the specific macro that you want to apply.
	Enter global configuration mode.

	Command	Purpose
	{ | } [{ }] [{ }] [{ }]	Apply each individual command defined in the macro to the switch by entering . Specify to apply and to debug a macro to find any syntax or configuration errors. Append the macro with the required values by using the keywords. Keywords that begin with require a unique parameter value. You can use the **?** command to display a list of any required values for the macro. If you apply a macro without entering the keyword values, the commands are invalid and are not applied. (Optional) Specify unique parameter values that are specific to the switch. You can enter up to three keyword-value pairs. Parameter keyword matching is case sensitive. The corresponding value replaces all matching occurrences of the keyword.
	interface	(Optional) Enter interface configuration mode, and specify the interface on which to apply the macro.
Step 6		
Step 7		
Step 8		
Step 9		
Step 10		

You can only delete a global macro-applied configuration on a switch by entering the version of each command in the macro. You can delete a macro-applied configuration on a port by entering the interface configuration command.

This example shows how to display the macro, to apply the macro and to set the access VLAN ID to 25 on an interface:

```
configure terminal
        interface gigabitethernet0/4
           macro apply cisco-desktop $AVID 25
```

Displaying Auto Smartports and Static Smartports Macros

Table 11-5 Commands for Displaying Auto Smartports and Static Smartports Macros
