Avaya Solution & Interoperability Test Lab

A Sample Configuration of Avaya C360 Multilayer Stackable Switches working with Avaya S8300 Media Server/ Avaya G700 Media Gateway, Avaya IP Telephone and Avaya IP Softphone - Issue 1.0

Abstract

These Application Notes present a sample configuration for Avaya C360 Multilayer Stackable Switches working with Avaya S8300 Media Server/G700 Media Gateway, Avaya IP Telephone and Avaya IP Softphone. The configuration of VLAN, 802.1Q Tagging, IP Routing and Quality of Service (QoS) are also covered in these Application Notes.

1. Introduction

The Avaya C360 Converged Stackable Switch Series is a line of stackable, multilayer switches that provide high availability, Quality of Service (QoS), and IEEE 802.3af Power over Ethernet (PoE) to enhance converged network infrastructure operations. The Avaya C360 series switches have four models available as shown in **Table 1**.

Model	**10/100BASE-T Ports**	**FBIC SFP Ports**	**PoE (on 10/100BASE-T)**
C363T	24	2	N/A
C363T-PWR	24	2	Yes
C364T	48	2	N/A
C364T-PWR	48	2	Yes

Table 1: C360 Switch Configurations

The C360 Multilayer Switch provides a rich feature set including VLAN support, Stacking, Security, QoS and web based management. Some of the major features provided by the C360 are:

- LAN services
  -- Multiple VLANs per port
  -- 802.1Q tagging
  -- 802.1w Rapid Spanning Tree Protocol
  -- 802.1X PBNAC (Port Based Network Access Control)
  -- Stacking
  -- LAG (Link Aggregate Group)
  -- 802.3af Power over Ethernet
- Layer 3 Support
  -- IP Routing (RIP and OSPF)
  -- Inter-VLAN routing
  -- VRRP (Virtual Router Redundancy Protocol)
- QoS (CoS and DiffServ)
- The built-in Device Manager (Embedded Web Manager)

These Application Notes focus on the configuration of C360 in these areas: VLAN Tagging, QoS, IP Routing and 802.1x Authentication. Note that these Application Notes will not cover the configuration for Avaya S8300 Media Server/G700 Media Gateway, Avaya IP Office, RADIUS and DHCP server. Please refer to the Application Notes listed in the **Appendix B** for their configuration.

Figure 1 displays the network infrastructure used for verification.

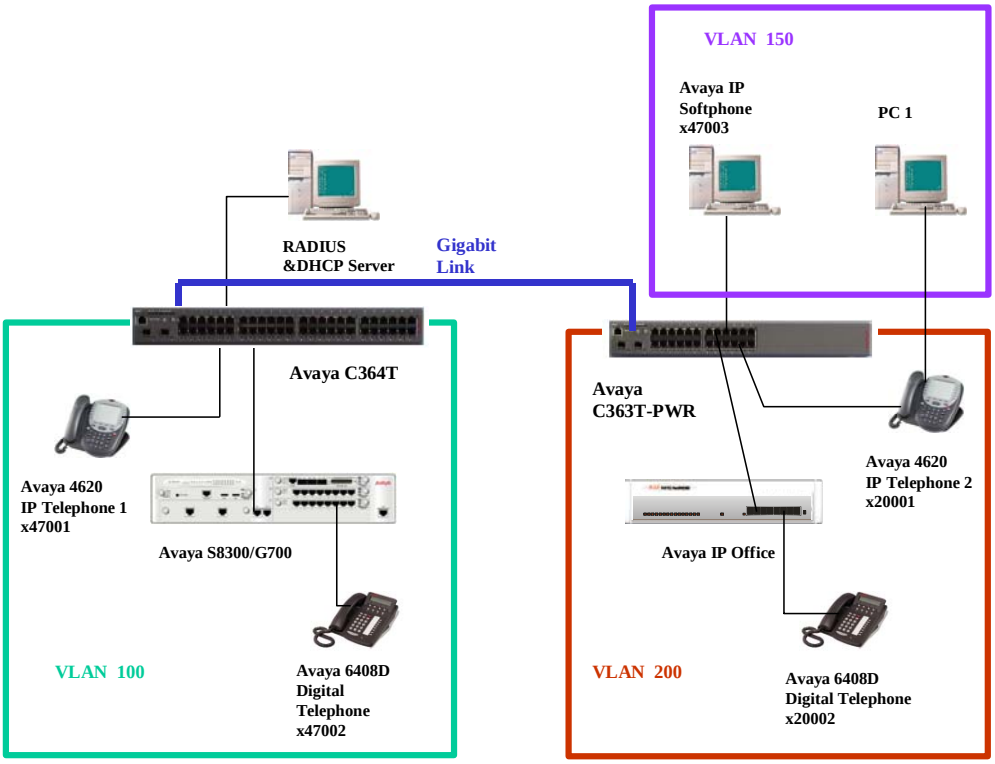

Figure 1: Network Configuration

Table 2 shows the devices VLAN and IP network assignment.

Switches	Interface/port	VLAN, IP Address	Default Gateway
C364T	Inband (Layer 2) VLAN150 (Layer 3) VLAN100 (Layer 3)	V150, 150.1.1.2 V150, 150.1.1.1 V100, 10.4.4.1	150.1.1.1
C363T-PWR	Inband (Layer 2) VLAN150 (Layer 3) VLAN200 (Layer 3)	V150, 150.1.1.4 V150, 150.1.1.3 V200, 200.1.1.1	150.1.1.3
S8300/G700	ICC MGP VOIP	V100, 10.4.4.78 V100, 10.4.4.79 V100, 10.4.4.80	10.4.4.1 10.4.4.1 10.4.4.1
IP Office	LAN 1	V200, 200.1.1.2	200.1.1.1
RADIUS Server	Network interface	V150, 150.1.1.10	150.1.1.1

Table 2: VLAN and IP Network Assignment

Table 3 lists the switches' port assignment.

Port	C364T	Port	C363T-PWR
Port 1/1	G700 Media Gateway	Port 1/1	IP Office
Port 1/2	IP 4620 Telephone	Port 1/11	IP 4620 IP Telephone
Port 1/11	RADIUS/DHCP Server	Port 1/12	IP Softphone
Port 1/51	Uplink to C363T-PWR	Port 1/51	Uplink to C364T

Table 3: Switches Ports Assignment

Table 4 lists the equipment and software used for the verification.

Equipment	Software
Avaya S8300 Media Server	R012x.00.1.221.1
Avaya G700 Media Gateway	Firmware Version 21.10.0
Avaya C364T Multilayer Stackable Switch	R4.8.10
Avaya C363T-PWR Multilayer Stackable Switch	R4.8.10
Avaya 4620 IP Telephone	R2.0
Avaya IP Softphone	V5.0.1.2
Avaya IP Office	R2.0
Cisco Access Control Server (Radius)	R3.2 (2)

Table 4: Hardware and Software Used for Verification

2. Configure the Avaya C364T Multilayer Stackable Switch

The configuration of C360 can be accomplished by using either the web interface, or the command line interface. These Application Notes demonstrate the configuration using the command line interface (CLI) via the switch's console connection. To access the C360 switch via its console port, configure a terminal emulator with the following settings:

- Bits per second **9600**
- Data bits **8**
- Parity **None**
- Stop bits **1**
- Flow control **None**

Log into the C360 switch with an appropriate login ID and password. Following the steps below to configure the device.

Description
This section displays the layer 2 switch port, VLAN and in-band management interface configuration. The uplink to the C363T-PWR is connected via its Gigabit Port 1/51.

- *Configure VLAN, in-band interface and assign ports to VLAN. In this configuration, two VLANs are created: VLAN 150 for data, and VLAN 100 for voice.*

```
C360-1(super)# configure
C360-1# set vlan 100 name voice100
C360-1# set vlan 150 name data150
C360-1# set interface inband 150 150.1.1.2 255.255.255.0

C360-1# set port vlan 100 1/1-10      -- assign ports 1-10 to VLAN 100
C360-1# set port vlan 150 1/11-20     -- assign ports 11-20 to VLAN 150
C360-1# set port vlan 150 1/51        -- assign Gigabit port 51 to VLAN150

C360-1# set trunk 1/1 dot1q           -- set port 1/1 to 802.1Q mode
C360-1# set port vlan-binding-mode 1/1 bind-to-configured
C360-1# set trunk 1/2 dot1q           -- set port 1/2 to 802.1Q mode
C360-1# set port vlan-binding-mode 1/1 bind-to-configured
C360-1# set trunk 1/51 dot1q          -- set Gigabit port 51 to 802.1Q mode
C360-1# set port vlan-binding-mode 1/51 bind-to-all
```

- *Configure 802.1x authentication. Assuming a RADIUS server has been configured and connected to the network as shown in **Figure 1**. Note that globally enabling the dot1x authentication applies to every switch port on the switch. For devices that do not support dot1x, for example, IP telephones, these switch ports should be set to force-authorize before dot1x is enabled on the switch.*

```
C360-1# set port dot1x port-control 1/11 force-authorize
-- disable the dot1x on the port connected to RADIUS

C360-1# set port dot1x port-control 1/1 force-authorize
-- disable the dot1x on the port connected to the G700 Media Gateway

C360-1# set port dot1x port-control 1/2 force-authorize
-- disable the dot1x on the port connected to the IP telephone

C360-1# set dot1x system-auth-control enable    -- enable the dot1x on the switch
C360-1# set radius authentication enable        -- enable radius authentication
C360-1# set radius authentication server 150.1.1.10 primary  -- assign the radius
                                                              server as a primary server
```

Description

----- This section displays the Layer 3 configuration. -----

- *The switch requires a license to enable routing capability. Assuming the Layer 3 license is available for this switch. To configure routing, set the switch to router mode by following the steps below.*

```
C360-1# set license 1 xxx xxx router   -- replace the xxx xxx with license code
C360-1# set device-mode router        -- enable router mode on the switch
```

- *Set router interfaces and assign VLAN and IP addresses to these interfaces.*

```
C360-1# session router
Router-1 (super)# configure
Router-1 (configure)# set vlan 100 name vlan100  -- create vlan interface for voice
Router-1 (configure)# interface vlan100
Router-1(config-if:vlan100)# ip vlan 100
Router-1(config-if:vlan100)# ip address 10.4.4.1 255.255.255.0
Router-1(config-if:vlan100)# ip bootp-dhcp server 150.1.1.10

Router-1 (configure)# set vlan 150 name vlan150  -- create vlan interface for data
Router-1 (configure)# interface vlan150
Router-1(config-if:vlan150)# ip vlan 150
Router-1(config-if:vlan1500)# ip address 150.1.1.1 255.255.255.0
```

- *Configure IP routing on the switch. Both the OSPF and RIP configuration is presented below, but only one should be used unless routing redistribution is required.*

```
Router-1 (super)# configure
Router-1 (configure)# router ospf
Router-1 (configure router:ospf)# network 150.1.1.0 0.0.0.255 area 0.0.0.0
Router-1 (configure router:ospf)# network 10.4.4.0 0.0.0.255 area 0.0.0.0
Router-1 (configure router:ospf)# exit

Router-1 (configure)# router rip
Router-1 (configure router:rip)# network 150.1.1.0 0.0.0.255
Router-1 (configure router:rip)# network 10.4.4.0 0.0.0.255
Router-1 (configure router:rip)# exit
```

Description
■ *Configure Layer 2(CoS) and Layer 3 QoS (DSCP). By default, all switch ports are set to priority level 0 and not to trust CoS/DSCP value from incoming packets. To prioritize traffic based on packets' CoS or DSCP value, the command " ip access-list-dscp trust-cos-dscp" can be used. To prioritize traffic for untagged packet, the command "set port level 0-7" can be used. Each switch port has four transmit queues. The CoS to queue assignment are as follows:* *Q1 Q2 Q3 Q4* *CoS: 0,1 2,3 4,5 6,7* *All DSCP to CoS mapping are assigned by the switch internal mapping table. For default CoS-DSCP mapping, refer to Appendix A. The switch uses WRR as its default setting. The strict priority queuing can be set on the switch to priority VoIP if needed. The configuration below shows how to set strict priority queuing on the switch.*
C360-1# **set queuing scheme strict 1** *-- set switch queuing scheme to strict priority* C360-1# **set port level 1/11 6** *-- set port 1/11 priority level to 6 for RADIUS* C360-1# **session router** Router-1 (super)# **ip access-list 100 1 permit ip any any** Router-1 (super)# **ip access-list-dscp trust 100 trust-cos-dscp** *-- Create an access list for all IP traffic and set switch globally to trust both cos and dscp values for incoming traffic.*

3. Configure the Avaya C363T-PWR

The Avaya C363T-PWR provides the same functionality as the Avaya C646T Multilayer Switch. In addition, the C363T-PWR provides IEEE 802.3af-compliant "Inline" DC power over Ethernet for all its 24 10/100 switch ports.

Power over Ethernet is enabled by default for all 10/100 switch ports. The C363T-PWR switch uses the specific resistance powered device signature and PD (powered device) connection verification to determine whether to supply power to a given port. Each port can supply up to 15.4W by default. The power priority mechanism is also implemented in C363T-PWR. This mechanism determines the order in which ports should be guaranteed power in case the power resources of the switch reach the budget. There are three user-configurable priority levels:

- Low
- High
- Critical

The default value is "Low" for all ports. Within these levels, priority is according to port number: the lower the port number, the higher the priority.

Description

----- This section displays the Layer 2 configuration. -----

- *Configure VLAN, in-band interface and assign ports to VLAN. In this configuration two VLANs are created: VLAN 150 for data and VLAN 200 for voice. The IP telephone is set to 802.1Q mode.*

```
C360-1(super)# configure
C360-1# set vlan 150 name data-v150
C360-1# set vlan 200 name voice-v200
C360-1# set interface inband 150 150.1.1.4 255.255.255.0

C360-1# set port vlan 200 1/1-10      -- assign ports 1-10 to VLAN 200
C360-1# set port vlan 150 1/11-20     -- assign ports 11-20 to VLAN 150
C360-1# set port vlan 150 1/51        -- assign Gigabit port 51 to VLAN150

C360-1# set trunk 1/11 dot1q          -- set port 1/11 to 802.1Q mode for IP telephone
C360-1# set port vlan-binding-mode 1/11 bind-to-configured
C360-1# set trunk 1/51 dot1q          -- set Gigabit port 51 to 802.1Q mode
C360-1# set port vlan-binding-mode 1/51 bind-to-all
```

- *Configure dot1x on the switch*

```
C360-1# set port dot1x port-control 1/1 force-authorize  -- disable the dot1x on the
                                                            port connected to the IP Office
C360-1# set port dot1x port-control 1/11 force-authorize -- disable the dot1x on the
                                                            port connected to the IP telephone

C360-1# set dot1x system-auth-control enable
C360-1# set radius authentication enable
C360-1# set radius authentication server 150.1.1.10 primary
```

----- This section displays the Layer 3 configuration. -----

- *Set switch to router mode. Assuming the routing license is available for this switch.*

```
C360-1# set license 1 xxx xxx router   -- replace the xxx xxx with license code
C360-1# set device-mode router        -- enable Layer 3 mode on the switch
```

Description

- *Set router interfaces and assign VLAN and IP addresses to these interfaces.*

C360-1# **session router**
Router-1 (super)# **configure**
Router-1 (configure)# **set vlan 200 name voice200** *-- create vlan interface for voice*
Router-1 (configure)# **interface voice200**
Router-1(config-if:voice200)# **ip vlan 200**
Router-1(config-if:voice200)# **ip address 200.1.1.1 255.255.255.0**
Router-1(config-if:voice200)# **ip bootp-dhcp server 150.1.1.10**

Router-1 (configure)# **set vlan 150 name data150** *-- create vlan interface for data*
Router-1 (configure)# **interface data150**
Router-1(config-if:data150)# **ip vlan 150**
Router-1(config-if:data150)# **ip address 150.1.1.3 255.255.255.0**

- *Configure IP routing on the switch. Both OSPF and RIP configuration is presented below, but only one should be used unless routing redistribution is required.*

Router-1 (super)# **configure**
Router-1 (configure)# **router ospf**
Router-1 (configure router:ospf)# **network 150.1.1.0 0.0.0.255 area 0.0.0.0**
Router-1 (configure router:ospf)# **network 200.1.1.0 0.0.0.255 area 0.0.0.0**
Router-1 (configure router:ospf)# **exit**

Router-1 (configure)# **router rip**
Router-1 (configure router:rip)# **network 150.1.1.0 0.0.0.255**
Router-1 (configure router:rip)# **network 200.1.1.0 0.0.0.255**
Router-1 (configure router:rip)# **exit**

- *Configure QoS.*

C360-1# **set queuing scheme strict 1** *-- set switch queuing scheme to strict*
C360-1# **set port level 1/1 6** *-- set port 1/1 priority level to 6 for the IP Office*

C360-1# **session router**
Router-1 (super)# **ip access-list 100 1 permit ip any any**
Router-1 (super)# **ip access-list-dscp trust 100 trust-cos-dscp**
-- Create an access list for all IP traffic and set the switch globally to trust both CoS and DSCP values for incoming traffic. Note that the IP Softphone is running on the Windows 2000 PC. In order for the IP Softphone application to set DSCP value defined from the "IP-Network-Region" form, the service QoS packet scheduler must be added to that PC.

Description
■ *Configure Inline Power.* *Since the Inline Power is enabled by default, this portion of configuration shows how to disable Inline Power on the switch port, as well as change the port Inline Power priority.*
C360-2# **set port powerinline 1/1 disable** *-- disable inline power for port connected to the IP Office* C360-2# **set port powerinline 1/12 disable** *-- disable inline power for port connected to the IP Softphone* C360-2# **set port powerinline priority 1/11 high** *-- set inline power priority to high for port connected to the IP telephones*

4. Verification Steps

The following steps can be used to verify correct system operation:

- Connect IP Telephones and IP Softphone to the switches. Verify the telephones can get IP addresses from a DHCP server, register properly, and calls can be placed.
- Make calls call between different telephones and verify that voice quality is good.
- Make conference calls between different telephones and verify the voice quality is good.

5. Conclusion

These Application Notes provide configuration steps for Avaya C360 Multilayer Stackable Switches. The procedures to configure VLAN, 802.1Q Tagging, QoS, IP Routing, Power over Ethernet and 802.1x Authentication were described in detail. The Avaya C360 Multilayer Stackable Switch has a rich set of switching and routing functionality. The built-in web management interface, the QoS feature and the 802.3af PoE capability make the C360 series switches ideal edge devices for VoIP applications.

Appendix A. C360 Switch Default DSCP-CoS Mapping

DSCP	Action	Precedence	Name
0 – 7	fwd0	mandatory	DSCP#0 – DSCP#7
8 – 15	fwd1	mandatory	DSCP#8 – DSCP#15
16- 23	fwd2	mandatory	DSCP#16 – DSCP#23
24 – 31	fwd3	mandatory	DSCP#24 – DSCP#31
32 – 39	fwd4	mandatory	DSCP#32 – DSCP#39
40 – 47	fwd5	mandatory	DSCP#40 – DSCP#47
48 – 55	fwd6	mandatory	DSCP#48 – DSCP#55
56 – 63	fwd7	mandatory	DSCP#56 – DSCP#63

Appendix B.

Use this URL
http://www1.avaya.com/enterprise/resourcelibrary/applicationnotes/eclips_interop.html to access these Application Notes.

[1] Sample Configuration: Avaya MultiVantage™ Software with Avaya S8300 Media Server Local Survivable Processor and an Avaya G700 Media Gateway - Issue 1.0

[2] Configuring the Avaya 3606 Wireless Telephone with Compatible 802.11b Access Points from Avaya and Other Vendors - Issue 1.0

[3] Configuring the Funk Odyssey Software, Avaya Access Point 3 and Avaya 802.11a/b Wireless Client for User Authertication (802.1x) and Data Encryption - Issue 1.0

Please e-mail any questions or comments pertaining to these Application Notes along with the full title name and filename, located in the lower right corner, directly to the Avaya Solution & Interoperability Test Lab at interoplabnotes@list.avaya.com