



**Avaya Solution & Interoperability Test Lab**

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## **Application Notes for Foundry Networks FastIron Super X Switch with Avaya Communication Manager - Issue 1.0**

### **Abstract**

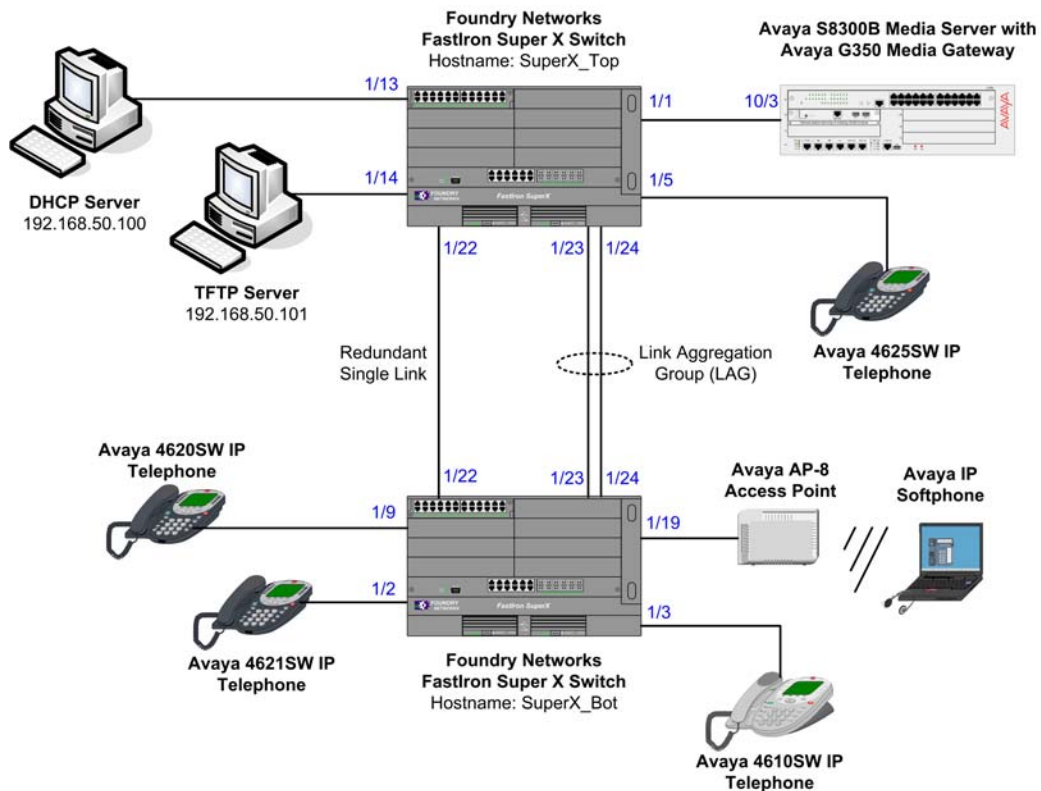
These Application Notes describe the procedures for configuring the Foundry Networks FastIron Super X switch to interoperate with an Avaya S8300B Media Server with G350 Media Gateway. Information in these Application Notes has been obtained through compliance testing and additional technical discussions. Testing was conducted via the Developer*Connection* Program at the Avaya Solution and Interoperability Test Lab.

# 1. Introduction

These Application Notes describe a compliance-tested configuration utilizing the Avaya S8300B Media Server, Avaya G350 Media Gateway and Foundry Networks FastIron Super X Switches.

The Foundry Networks FastIron Super X switch is a modular high performance Gigabit Ethernet switch. It has comprehensive IP routing and Quality of Service (QoS) features needed to support VoIP in LAN environments. Each physical port is equipped with 8 hardware ingress and egress queues which can be programmed to support Weighted Round Robin (WRR), Strict Priority (SP), or a combination of WRR and SP queue servicing. Quality of Service can be classified by port, VLAN, MAC, ACL, 802.1p, Type of Service (ToS) or DiffServ. **Figure 1** depicts two Foundry Networks FastIron Super X switches interconnected using a Link Aggregation Group (LAG) for bandwidth aggregation and redundancy, along with an additional redundant link. Rapid Spanning Tree Protocol (RSTP) (also called IEEE 802.1w) has been implemented to allow for rapid spanning tree re-convergence to minimize topology change impacts on VoIP.

The sample configuration demonstrates the use of QoS, LAG, STP and DHCP relay. The configuration is designed to support ports with a single Avaya IP Telephone, single PC or an Avaya IP Telephone with attached PC.



**Figure 1: Sample LAN Configuration**

## 2. Equipment and Software Validated

The following equipment and software/firmware were used for the sample configuration provided:

Equipment	Software/Firmware
Avaya S8300B Media Server in a G350 Media Gateway	3.0.1 (load 346)
Avaya 4610SW IP Telephone	2.3
Avaya 4620SW IP Telephone	2.3
Avaya 4621SW IP Telephone	2.3
Avaya 4625SW IP Telephone	2.5
Avaya AP-8 Wireless Access Point	2.6.0(914)
Avaya IP Softphone	5.2.3.6
Foundry Networks FastIron Super X Switch	2.4.00

## 3. Configure the FastIron Super X Switches

The following section shows the configuration of the “SuperX\_Top” Foundry Networks FastIron Super X switch used in these Application Notes with comments to explain key aspects of the configuration.

### *“SuperX\_Top” FastIron Super X Switch Configuration*

Current configuration:

```
!  
ver 02.4.00T3e3  
!  
module 1 fi-sx4-24-port-gig-copper-module  
module 9 fi-sx4-12-combo-port-management-2-module  
!  
global-stp  
!  
vlan 1 name DEFAULT-VLAN by port  
spanning-tree 802-1w  
!  
vlan 9 by port          // Define a Data only Virtual LAN, ex. VLAN 9  
tagged ethe 1/5 ethe 1/22 to 1/24 // Tag the Data only VLAN on all ports  
router-interface ve 9    // Map Virtual Engines to VID's, ex. Ve 9 to VLAN 9  
spanning-tree 802-1w    // Enable rapid spanning tree on all VLANs  
spanning-tree 802-1w priority 4095 // Force SuperX_Top as root via priority  
spanning-tree 802-1w ethe 1/5 admin-edge-port // Define edge and p2p  
spanning-tree 802-1w ethe 1/22 admin-pt2pt-mac // ports to enable rapid  
spanning-tree 802-1w ethe 1/23 admin-pt2pt-mac // reconvergence.  
spanning-tree 802-1w ethe 1/24 admin-pt2pt-mac  
!  
vlan 10 by port        // Define a Voice only VLAN, ex. VLAN 10  
tagged ethe 1/5 ethe 1/22 to 1/24 // Tag the Voice only VLAN on all ports  
router-interface ve 10  
spanning-tree 802-1w
```

```

spanning-tree 802-1w priority 4095
spanning-tree 802-1w ethe 1/5 admin-edge-port
spanning-tree 802-1w ethe 1/22 admin-pt2pt-mac
spanning-tree 802-1w ethe 1/23 admin-pt2pt-mac
spanning-tree 802-1w ethe 1/24 admin-pt2pt-mac
!
vlan 50 by port          // Define an Boot Server only VLAN, ex. VLAN 50
tagged ethe 1/22 to 1/24 // Tag all switch-to-switch ports
untagged ethe 1/13 to 1/14 // Add App Server ports untagged
router-interface ve 50
spanning-tree 802-1w
spanning-tree 802-1w priority 4095
spanning-tree 802-1w ethe 1/13 admin-edge-port
spanning-tree 802-1w ethe 1/14 admin-edge-port
spanning-tree 802-1w ethe 1/22 admin-pt2pt-mac
spanning-tree 802-1w ethe 1/23 admin-pt2pt-mac
spanning-tree 802-1w ethe 1/24 admin-pt2pt-mac
!
vlan 60 by port          // Define an VoIP Server only VLAN, ex. VLAN 50
tagged ethe 1/22 to 1/24 // Tag all switch-to-switch ports
untagged ethe 1/1       // Untag the port to the G350 Media Gateway
router-interface ve 60
spanning-tree 802-1w
spanning-tree 802-1w priority 4095
spanning-tree 802-1w ethe 1/13 admin-edge-port
spanning-tree 802-1w ethe 1/14 admin-edge-port
spanning-tree 802-1w ethe 1/22 admin-pt2pt-mac
spanning-tree 802-1w ethe 1/23 admin-pt2pt-mac
spanning-tree 802-1w ethe 1/24 admin-pt2pt-mac
!
!
!
!
!
boot sys fl sec
hostname SuperX_Top
!
router ospf              // Enable OSPF routing using backbone area 0.0.0.0
 area 0
!
interface ethernet 1/1
 port-name G350          // Optionally define a port name
!
interface ethernet 1/5
 port-name 4625SW
 dual-mode 9             // Enable dual-mode support. In this case, VLAN 9
                          // will accept untagged frames from attached devices
                          // including directly or indirectly attached PCs
inline power             // Enable 802.3af inline power
!
interface ethernet 1/13
 port-name DHCP_Server
!
interface ethernet 1/14
 port-name TFTP_Server
!

```

```

interface ethernet 1/22
  port-name SINGLE LINK
!

interface ethernet 1/23
  link-aggregate active // Enable dynamic 802.1ad link aggregation for ports
! // 1/23 and 1/24
interface ethernet 1/24
  link-aggregate active
!
interface ve 9 // Create a virtual interface for each VLAN
  port-name DATA
  ip address 9.9.9.102 255.255.255.0
  ip helper-address 1 192.168.50.100 // Enable DHCP relay on applicable
  ip ospf area 0 // subnets
!
interface ve 10
  port-name VOICE
  ip address 10.10.10.102 255.255.255.0
  ip helper-address 1 192.168.50.100
  ip ospf area 0
!
interface ve 50
  port-name SERVERS
  ip address 192.168.50.102 255.255.255.0
  ip ospf area 0
!
interface ve 60
  port-name G350
  ip access-group 101 in // Apply ACL to force DSCP honoring on VLAN 60
  ip address 60.60.60.200 255.255.255.0
  ip helper-address 1 192.168.50.100
  ip ospf area 0
!
!
!
access-list 101 permit ip any any dscp-cos-mapping // ACL to match on DSCP
!
!
!
!
!
end

```

The following section shows the configuration of the “SuperX\_Bot” Foundry Networks FastIron Super X switch used in these Application Notes with some comments to explain key aspects of the configuration. Since many of the configuration parameters are similar to “SuperX\_Top” configuration, duplicate comments were not included here for brevity.

### ***“SuperX\_Bot” FastIron Super X Switch Configuration***

Current configuration:

```
!
ver 02.4.00T3e3
!
module 1 fi-sx4-24-port-gig-copper-module
module 9 fi-sx4-12-combo-port-management-module
!
global-stp
!
!
vlan 1 name DEFAULT-VLAN by port
  spanning-tree 802-1w
!
vlan 10 by port
  tagged ethe 1/2 to 1/3 ethe 1/9 ethe 1/22 to 1/24
  untagged ethe 1/19 // Untag AP8 port
  router-interface ve 10
  spanning-tree 802-1w
  spanning-tree 802-1w ethe 1/1 admin-edge-port
  spanning-tree 802-1w ethe 1/2 admin-edge-port
  spanning-tree 802-1w ethe 1/3 admin-edge-port
  spanning-tree 802-1w ethe 1/4 admin-edge-port
  spanning-tree 802-1w ethe 1/7 admin-edge-port
  spanning-tree 802-1w ethe 1/9 admin-edge-port
  spanning-tree 802-1w ethe 1/11 admin-edge-port
  spanning-tree 802-1w ethe 1/22 path-cost 50000 admin-pt2pt-mac

// Administer higher path cost on single Gigabit Ethernet port so that Link
// Aggregation group is the preferred forwarding path on all applicable VLANs

  spanning-tree 802-1w ethe 1/23 admin-pt2pt-mac
  spanning-tree 802-1w ethe 1/24 admin-pt2pt-mac
!
vlan 60 by port
  tagged ethe 1/22 to 1/24
  router-interface ve 60
  spanning-tree 802-1w
  spanning-tree 802-1w ethe 1/22 path-cost 50000 admin-pt2pt-mac

// Administer higher path cost on single Gigabit Ethernet port so that Link
// Aggregation group is the preferred forwarding path on all applicable VLANs

  spanning-tree 802-1w ethe 1/23 admin-pt2pt-mac
  spanning-tree 802-1w ethe 1/24 admin-pt2pt-mac
!
vlan 9 by port
  tagged ethe 1/2 to 1/3 ethe 1/9 ethe 1/22 to 1/24
```

```

router-interface ve 9
spanning-tree 802-1w
spanning-tree 802-1w ethe 1/2 admin-edge-port
spanning-tree 802-1w ethe 1/3 admin-edge-port
spanning-tree 802-1w ethe 1/9 admin-edge-port
spanning-tree 802-1w ethe 1/19 admin-edge-port
spanning-tree 802-1w ethe 1/22 path-cost 50000 admin-pt2pt-mac

// Administer higher path cost on single Gigabit Ethernet port so that Link
// Aggregation group is the preferred forwarding path on all applicable VLANs

spanning-tree 802-1w ethe 1/23 admin-pt2pt-mac
spanning-tree 802-1w ethe 1/24 admin-pt2pt-mac
!
!
!
!
!
hostname SuperX_Bot
router ospf
area 0
!
interface ethernet 1/2
port-name 4621SW
dual-mode 9
inline power
!
interface ethernet 1/3
port-name 4610SW
dual-mode 9
inline power
!
interface ethernet 1/9
port-name 4620SW
dual-mode 9
inline power
!
interface ethernet 1/19
port-name AP8
inline power
!
interface ethernet 1/22
port-name SINGLE_LINK
!
interface ethernet 1/23
link-aggregate active
!
interface ethernet 1/24
link-aggregate active
!
interface ve 9
ip address 9.9.9.101 255.255.255.0
ip helper-address 1 192.168.50.100
ip ospf area 0
!
interface ve 10

```

```
ip address 10.10.10.101 255.255.255.0
ip helper-address 1 192.168.50.100
ip ospf area 0
!
interface ve 60
ip address 60.60.60.254 255.255.255.0
ip helper-address 1 192.168.50.100
ip ospf area 0
!
!
!
!
!
!
!
end
```

## 4. Interoperability Compliance Testing

The interoperability compliance testing focused on verifying QoS connectivity and link resiliency options between the Foundry Networks FastIron Super X Switch, Avaya Communication Manager, Avaya IP Telephones and Avaya AP-8 Wireless Access Points.

### 4.1. General Test Approach

Feature testing was performed manually. Calls were made between stations registered to the Avaya S8300B Media Server with Avaya G350 Media Gateway. While calls were being made, a network analyzer was used to monitor call signaling and audio flows to ensure that proper QoS markers at Layer 2 and Layer 3 were being relayed. Performance testing was conducted using data traffic generator to stress the QoS functionality of the devices over a 1-hour period.

### 4.2. Test Results

All feature, and performance test cases passed successfully. A 1-hour test was conducted with 2 Gbps of 64-byte UDP traffic saturating the 1 Gbps single link between the switches and over the 2 Gbps aggregated links. No calls were lost or impacted during the test. LAG failover and RSTP reconvergence was also verified to ensure that audio traffic was not severely impacted during topology changes.

## 5. Verification Steps

The following steps may be used to verify the configuration:

1. Verify link autonegotiation and inline power support using LED and phone display.
2. Verify that the Avaya 4600 Series IP Telephones successfully register with Avaya Communication Manager and complete phone calls to other phones (assumes the IP telephones have been configured with the correct IP and call control information).
3. Verify the Avaya Wireless Access Point by having an Avaya IP Softphone running on a wireless laptop accessing the network via the Access Point successfully register with Avaya Communication Manager and complete phone calls to other phones.



## 6. Support

For technical support on Foundry Networks products, contact the Technical Support Center using any of the following options:

- Toll-free: 1-877-TURBOCALL (1-877-887-2622)
- Direct: 408-586-1881
- Email: [support@foundrynet.com](mailto:support@foundrynet.com)

## 7. Conclusion

These Application Notes depict a configuration for implementing Avaya Communication Manager IP Telephony over a network based on Foundry Networks FastIron Super X switches. The FastIron Super X switches were responsible for enforcing QoS in order to achieve good voice quality over the LAN under periods of heavy data applications traffic congestion. The two options validated for prioritizing VoIP signaling and audio were cos-DiffServ mapping via an Access Control List (ACL) at Layer 3 and trusting only cos/802.1p priority values at Layer 2 (default behavior).

## 8. Additional References

This section references the Avaya and Foundry Networks product documentation that are relevant to these Application Notes. The following Avaya product documentation can be found at <http://support.avaya.com>.

- [1] Administration for Network Connectivity for Avaya Communication Manager, Issue 8, June 2004; Document Number 555-233-504.
- [2] Administrator's Guide for Avaya Communication Manager, Issue 8, June 2004; Document Number 555-233-506.
- [3] Administration of the Avaya G350 Media Gateway, Issue 2, June 2004; Document Number 555-245-501.

The following Foundry Networks product documentation can be found at <http://www.foundrynet.com>

- [4] Foundry SuperX Switch Installation and Basic Configuration Guide, April 2005
- [5] Foundry Switch and Router Installation and Basic Configuration Guide, August 2005

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