

Avaya Solution & Interoperability Test Lab

# Application Notes for Kentrox Q-2300 connected to an Avaya IP Office - Issue 1.0

### Abstract

These Application Notes describe the configuration of a Voice over IP (VoIP) solution using the Kentrox Q-Series Q2300 access router and Avaya IP Office. The Kentrox Q-Series Q2300 was compliance-tested with an Avaya IP Office. Emphasis was placed on verifying voice quality in a small office scenario. Information in these Application Notes has been obtained through compliance testing and additional technical discussions. Testing was conducted via the *DeveloperConnection* Program at the Avaya Solution and Interoperability Test Lab.

### 1. Introduction

These Application Notes describe a Voice over IP (VoIP) solution using Quality of Service (QoS) on the Kentrox Q-Series Q2300 Router connected to an Avaya IP Office. The Kentrox Q-Series Q2300 Access Router was compliance-tested with an Avaya IP Office.

Compliance testing emphasis was placed on verifying voice quality in a small office scenario using low bandwidth serial T-1 links for the private IP WAN network. QoS based on Layer 3 Differentiated Services was implemented across the network to prioritize voice traffic over the WAN. Compliance testing included throughput, Direct Media and codec's 711 and 729.

### Kentrox Q-Series Q2300 Access Route

The Q2300 router combines the features of an IP router, QoS appliance, IPSec VPN appliance, firewall, and Ethernet switch into one easy-to-use network access device.

The configuration in Figure 1 shows a corporate site connected to a remote office site.

For the compliance testing the DHCP server function on Avaya IP Office and Q2300 were disabled and instead a centralized corporate DHCP server was put in place to handle both the corporate and remote sites. To better manage the different traffic types at each site, the voice and data traffic were separated onto different VLANs.

### **Corporate site**

The corporate site consists of an Avaya IP Office 406V2 connected to the Extreme Summit 300 Switch with two Avaya IP Telephones and one Avaya digital phone, which in turn is connected to the WAN. The corporate site provides a DHCP server for assigning IP network parameters to the Avaya IP Telephones.

### **Remote office site**

The remote office site consists of a Kentrox Q2300 router, two Avaya 4600 and 5600 IP Telephones and a PC running Avaya IP Office Phone Manager Pro. The Q2300 is rate limiting the WAN port to 1.54 Megs to not exceed the WAN bandwidth limitations and is providing DHCP relay functions so that a centralized DHCP server can be used. The Phones and the PC running Avaya Phone ManagerPro are registering to the IP Office at the corporate site.



Figure 1: Network Configuration

TMA; Reviewed: SPOC 8/24/2006

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# 2. Equipment and Software Validated

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

Equipment	Software/Firmware
Avaya IP Office IP406V2	3.1(65)
Avaya 4620 IP Telephones	2.3
Avaya 5602 Telephones	2.3
Avaya 2410 Digital Telephone	N/A
Avaya IP Office Manager	3.1(65)
Avaya IP Office System Monitor	3.1(65)
Avaya IP Office Phone Manager Pro	3.1.15
Kentrox Q-Series Q2300	1.35
Extreme Networks Summit 300-48 Switch	ExtremeWare 7.4e.1.5

## 3. Avaya IP Office settings

No Kentrox specific configuration is required on Avaya IP Office to support this solution. Except where stated the parameters in all steps are the default settings and are supplied for reference. For all other provisioning information such as provisioning of the trunks, call coverage, and extensions, please refer to the Avaya IP Office product documentation.

Log into the PC running IP Office Manager and go to Start  $\rightarrow$  Programs  $\rightarrow$  IP Office  $\rightarrow$  Manager to launch the Manager application. Log into the Manager application using the appropriate credentials. In the Manager window that appears, select File  $\rightarrow$  Open to search for IP Offices in the network.

Step	Description					
1.	IP Office Manager window.					
	The main IP Office Manager window appears. It is from the Configuration Tree to the					
	left that all of the following steps are referring to.					
	Ben					
	Manager [192.168.42.255] (C:\Program Files\\Manager\) 00E007020406.cfg					
	<u>File Edit View Tools Window H</u> elp					
	Configuration Tree					
	B       Dorstor (3)         Control Dorot202006         B       Extension (15)         B       Extension (15)         B       Service (0)         B       Service (0)         B       Photode (68)         Control Unit (3)       Service (0)         B       Photode (68)         Control Unit (3)       Service (0)         B       Photode (69)         Control Unit (3)       Service (0)         B       Photode (69)         Control Unit (3)       Service (0)         B       Photode (69)         Control Unit (3)       Service (0)         Control Unit (3)       Service (0)         Control Unit (3)       Service (0)         Construct (1)       Service (1)         Construct Code (0)       Service (1)         Construct Code (1)       Service (1)         Service (1)       Service (1)         Service (1)       Service (1)					

Step	Description
2.	Verify Gatekeeper information.
	In the Manager window, go to the Configuration Tree and double-click System. Select
	the Gatekeeper Tab. Verify the DSCP setting for DSCP and SIG DSCP.
	Manager [192.168.42.255] (L:\Program Files\\Manager\) 00E007020406.cfg - [System Configuration : 00E0 ]_ [] X
	System LAN1 DNS Voicemail Telephony Gatekeeper LDAP SNMP CDR
	Gatekeeper Enable
	Direct Routed Signaling Enable
	Auto-create Extri Enable Port Range (maximum) 53246
	☐ Enable RSVP
	0xB8 DSCP(Hex) 46 DSCP
	0xFC DSCP Mask (Hex) 63 DSCP Mask
	0x88 SIG DSCP (Hex) 34 SIG DSCP
	176 SSON

Step	Description
3.	Disable DHCP server on Avaya IP Office.
	From the Configuration Tree double-click System. Select the LAN1 Tab. Set the
	DHCP Mode to Disabled. Press OK to continue.
	Manager [192.168.42.255] (C:\Program Files\\Manager\) 00E007020406.cfg - [System Configuration : 00E007020406]         Image: Configuration : 00E007020406]
	System LAN1 DNS Voicemail Telephony Gatekeeper LDAP SNMP CDR
	IP Address 192:168:42.1 Number Of DHCP IP Addresses 200
	IP Mask 255.255.255.0 DHCP Mode
	© Disabled
	C Dialin C Dient
	C None
	C Listen Only (Passive)
	C RIP 2 Broadcast (RIP 1 Compatibility)
	C RIP 2 Multicast
	UK <u>L</u> ancel <u>H</u> elp

Step	Description					
4.	Verify Direct Media Path.					
	From the Configuration Tree select Extensions. Double-click on the IP telephone					
	extension to check. Select the VoIP tab. Verify that the Allow Direct Media box is checked. Press OK to continue					
	Manager [192.168.42.255] (C:\Program Files\\Manager\) 00E007020406.cfg - [IP Extension 2 📃 🗆 🗙					
	Edit View Tools Window Help					
	Extn VolP					
	IP Address					
	Enable Faststart for non-Avaya IP phones					
	Voice Pkt. Size					
	Compression Mode G.711 ULAW 64K 🔽 🗖 Local Hold Music					
	MAC Address 00000000000 V Allow Direct Media Path					
	Gain Default					
	OK <u>C</u> ancel <u>H</u> elp					

# 4. Configure the Kentrox Q-Series Access Router

This section addresses configuring the Kentrox Q-Series Q2300 Access Router to route to the corporate site and the Avaya IP Office. Except where stated the parameters in all steps are the default settings and are supplied for reference. All required fields on the screens are indicated by a red asterisk (\*).

Note: For this compliance testing Port 4 was used for managing the Q2300.

Step Description						
1. Configure a PC to Manage the Q2300.	Configure a PC to Manage the Q2300.					
Configure the PC to use IP address 192.168.1.50/24 with a default gateway of 192.168.1.1						
which is the Kentrox O2300 IP Address. Connect the PC	to port 4 and then use Windows					
Internet Explorer to browse to the IP address of the C	2300 router Administration web					
nage Log into the O2300 using the appropriate	credentials When the O2300					
authentication window appears Press <b>OK</b>	eredentitals. When the Q2500					
authentication window appears. Tress <b>OK.</b>						
2 Configure the WAN interface						
2. Configure the WAN interface part on the O2200. To confi	sure the part select Configure >					
Fort 5 is the WAN interface port on the Q2500. To comp	gule the polt select <b>Compute</b> 7					
Interfaces 7 Ethernet Port 5. Click on the Configuration	on drop down list and select Edit					
<b>IP</b> . The interface box will automatically open.						
Q2300 - Microsoft Internet Explorer     Ele Edit View Favorites Iools Help						
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Address 🗃 http://192.168.1.1/configuration/ktxEthernetIfConfig.html	Co Links »					
KENTROX Q2300 Avaya Q2300 Testing	Help Log Out Online Support					
Configure > Interfaces > Ethernet Port 5						
System						
Interfaces Traffic						
Logs Ethernet Alias MAC Address Duplex 10/100 Link Up/Down	Trap Enabled Configuration					
CONFIGURE ipwan (Dynamic DHCP) Subnet Mask IP MTU MSS Clamp	Disabled Amake Selections  Controls					
System 0.0.0.0 255.0.0.0 1500 Enabled	Untrusted «Make Selection»					
Router Refret Configuration Not Saved						
Firewall						
QoS						
Config Changed						
Save Now?						
(e) Done	Internet					

Step	Description					
3.	Configure W	AN IP addres	SS.			
	Select Static IP Address, this will enable the IP Address and Subnet Mask fields for					lask fields for
	data entry. Enter the IP address 192.168.75.1 and Subnet Mask 255.255.255.0					
	Press OK to	continue.				
	Q2300 - Microsoft I	Internet Explorer				
	Eile <u>E</u> dit <u>V</u> iew F <u>a</u> vi	orites <u>T</u> ools <u>H</u> elp				
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	Address 🙆 http://192	2.168.1.1/configuration/K	.txEditIPConfig.html?Imk	<txiftree.ethwan< th=""><th></th><th>🖌 🔁 Go 🛛 Links 🎽</th></txiftree.ethwan<>		🖌 🔁 Go 🛛 Links 🎽
	KENTROX (	22300	Avaya	Q2300 Testing	Help Log	Out Online Support
	MONITOR	Configure > Interfa	ces > Ethernet Por	t 5 > IP Configuration		
	System					
	Interfaces	Edit IP Configura	tion	NAT Configuration	n - ipwan (Untrusted	1)
	Traffic	Static IP Address	G	Enable to Trusted		
	Logs	Dynamic IP Address	0	Enable to DMZ		
	CONFIGURE	IP I/F Name (Must be unique, ex:	* ipwan	Global Address Select	globalAddress 🗸 🗸	]
	System	IP-32)		Global Address	ipwan	
	Interfaces	IP Address	* 192.168.75.1	_		
	Router	Subnet Mask	* 255.255.255.0			
	Firewall	TCP MSS Clamp				
	VPN	Security Zone	Untrusted			
	Qos	* Required Field				
	Changed					
	Save Now?	OK Cancel	Co	nfiguration Not Saved		
						~
	🕘 Done					Internet .,;

Step	Description				
4.	Configure the Q2300 for VLANs.				
Select Configure → Interfaces → Ethernet Ports 1-4 and click the Configura					
	down list for the LAN Layer-2 switch. Select Switch to VLAN.				
	2 Q2300 - Microsoft Internet Explorer				
	Ele Edit View Favorites Iools Help				
	KENTROX Q2300 Avaya Q2300 Testing Help Log Out Online Support				
	MONITOR Configure > Interfaces > Ethernet Ports 1-4				
	System Interfaces Ethernet Layer 2 Switch Configuration bide all				
	Traffic				
	Logs           Logs         Layer 2 Switch Alias         Status         MAC Address         Trap Enabled         Port 1         Port 2         Port 3         Port 4         Configuration           -         LAN Layer 2 Switch Interface          LinkUp         001/201/081001:F6:DD         Disabled         Down         Up         Down         editable Selection >         V				
	CONFIGURE         iplan (Static)         Subnet Mask         IP MTU         MSS Clamp         Ecurity Zone         Make Selection> Ecit           System         192.168.1.1         255.255.255.0         1500         Enabled         Truted         Switch to VLAN				
	Interfaces				
	Refresh         Configuration Not Saved				
	VPN				
	QoS				
	Config Changed				
5	The following information box will appear. Press <b>OK</b> to continue				
	This will detach the IP interface and disrupt traffic. Are you sure ?				
	OK Cancel				

Step	Description
6.	Configure dot1Q trunk.
	Select Configure $\rightarrow$ Interfaces $\rightarrow$ Ethernet Ports 1-4 and click the Configuration drop
	down list for the LAN Layer-2 switch. Select Edit. Select the VLAN Link Mode drop
	down list for port and select <b>trunk</b>
	down list for port and screet if ank
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	Address 🗿 http://192.168.1.1/configuration/KtxEdit2SwitchConfig.html?ImKtxEfTree.ethlan
	Help Log Out Online Support
	MONITOR Configure > Interfaces > Ethernet Ports 1-4 > Edit Ethernet Configuration
	System  Ethernet Configuration - Kentrox Q2301 Ethernet interface ethlan
	Traffic
	Logs Alias LAN Layer 2 Switch In
	CONFIGURE MTU 1500
	System MAC Address 00:20:08:00:F6:DC
	Interfaces Link Up/Down Trap
	Firewall
	VPN Port Number VLAN Link Mode Link Up/Down 10/100 Duplex Physical Mode
	QoS 1 trunk V DOWN 10 Half AutoNegotiate V
	Config Changed Source New? 3 access V DOWN 10 Half AutoNegotiate V
	4 access V UP 100 Full AutoNegotiate V
	OK Cancel Apply Configuration Not Saved
	E Done Done

Step	Description	
7.	Configure the Default VLAN.	
	Enter information for VLAN Name, VLAN Alias, and VLAN ID. De-select ports 1, 2	<u>,</u>
	and 3. Press OK to continue. Enter a unique string for the VLAN Name and VLAN Alia	S
	as well as a unique VLAN ID number. Press OK to continue.	
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	Address 🙋 http://192.168.1.1/configuration/KtxL2SwitchVLANAdvanced.html?ImKtxIfTree.ethlan&switch 🔹 🔁 Go 🛛 Links 🎽	
	KENTROX Q2300 Avaya Q2300 Testing	
	MONITOR Configure > Interfaces > Ethernet Ports 1-4 > VLAN Configuration	
	System Add VI AN Confirmation	
	Interfaces Add VEXIV configuration	
	VLAN Name * Default (Must be unique, ex: YLAN-3)	
	VLAN Alias Default	
	System VLAN ID * 100	
	Interfaces Port 1 Enable	
	Router Port 2 Enable	
	Firewall Port 4 Enable	
	VPN * Required Field	
	Config Changed Save Now? OK Cancel Configuration Not Saved	
	Cone	

Step	Description						
8.	Configure Data VLAN.						
	Select Configure $\rightarrow$ Interfaces $\rightarrow$ Ethernet Ports 1-4 and click on the Configuration						
drop down list for the LAN Layer 2 switch. Select Add VLAN. Configure a unique							
	Name and VLAN Alias as well as the unique VLAN ID. Enter the IP I/F Name. IP						
	Address, and Subnet Mask. Check the Port 3 Enable box. Disable the DHCP server on						
	this VLAN by removing the check in the <b>DHCP Server Enable</b> option Press <b>O</b>						
	continue.			1			
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	RENTROX Q2300	Avaya Q2300 Testing			Help Log Out Online Support		
	MONITOR Configure > Interfaces > E	Ethernet Ports 1-4 > VLAN Configuration					
	Add VLAN Configuration		IP Configuration				
	Traffic VLAN Name	* VLAN200	Existing IP Interfaces	< New IP Interface >			
	Logs (must be unique, ex: vLAN-3) CONETCLIRE VLAN Alias	Data	IP I/F Name (Must be unique, ex: IP-32) IB Addross	* IP-200 * 192.168.200.1			
	System Part 1 Eastle	* 200	Subnet Mask	* 255.255.255.0			
	Interfaces Port 2 Enable		Security Zone DHCP Server Enable				
	Port 3 Enable						
	VPN * Required Field						
	Config Changed						
	Save Now? OK Cancel	Configuration Not Saved					
	<u></u> 副				Totemet		
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Step	Description					
9.	Configure Voice VLAN					
	Select Configure → In	Select Configure $\rightarrow$ Interfaces $\rightarrow$ Ethernet Ports 1-4 and click on the Configuration				
	pull down menu for the	LAN Layer 2 switch	and Select A	dd VLAN. C	onfigure a unique	
	VLAN Name and VLA	N Alias as well as the	e unique VLA	N ID. Enter	the IP I/F Name,	
	IP Address, and Subn	et Mask. Check the	Port 1 Enab	ole and Port	2 Enable boxes.	
	Disable the DHCP serv	ver on this VLAN by	removing the	e check in th	e DHCP Server	
	<b>Enable</b> option. Press <b>O</b>	<b>K</b> to continue.	C			
	2 Q2300 - Microsoft Internet Explorer					
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	KENTRE Q2300	Avaya Q2300 Testing			Help Log Out Online Support	
	MONITOR Configure > Interfaces > System	Ethernet Ports 1-4 > VLAN Configuration				
	Add VLAN Configuration	ı	IP Configuration			
	Traffic VLAN Name (Must be unique, ev: VLAN-3)	* Vlan90	Existing IP Interfaces	< New IP Interface > 💙		
	CONFIGURE VLAN Alias	Voice	IP I/F Name (Must be unique, ex: IP-32) IP Address	* IP-90		
	VLAN ID Port 1 Enable	*  90	Subnet Mask	* 255.255.255		
	Router Port 2 Enable	$\checkmark$	DHCP Server Enable			
	Firewall Port 4 Enable					
	VPN * Required Field					
	Config Changed					
	Save Now? OK Cancel	Configuration Not Saved	1			
	ê				Internet	

Step	Description			
10	Set the defaul	lt gateway.		
	Select Config	gure → Rou	ter $\rightarrow$ Routes and select the Add hyperline	x next to the "Default
	Route" title.			
	Provide a val	id Name and	d enter the gateway IP address in the Gates	vav IP address field.
	Select the <b>inv</b>	van port in th	The <b>IP Interface</b> list Press <b>OK</b> to continue	
	<b>r</b> -	· · · · · · · · · · · · · · ·		
	Q2300 - Microsoft Int	ternet Explorer		
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	Address 🚳 http://192.3	168.90.1/configuration/	KtxAddStaticRoute.html?parentnode=UNUSED&addDefault	Go Links »
	KENTROX OT	2300	Customer Location	
	KENTIN X Q2	2500		Help Log Out Online Support
	MONITOR	Configure > Router	> Routing > Route Configuration	
	System	Add Default Rout	re de la companya de	
	Interfaces		-	
	Traffic	Name	DfRoute	
	Logs	Destination IP Address	0.0.0	
	CONFIGURE	Subnet Mask	0.0.0	
	Interfaces	Gateway IP Address	192.168.75.2	
	Router		IP Interface List iplan 192.168.90.1 Trusted	
	Firewall		ipwan 192.168.75.1 Untrusted IP-200 192.168.200.1 Trusted	
	VPN	Gatowau Interface	IP-1 192.168.1.1 Trusted	
	QoS	dateway interface		
	Config			
	Changed			
	Save Now?	Cost	1	
		OK Cancel	Configuration Not	
			Saved	
	Done			internet

p	Description								
11.	Verify the default IP route has been added.								
	To display static routes, select Configure $\rightarrow$ Router $\rightarrow$ Routes.								
	Press Cancel to continue								
	Tress Cancer to continue.								
	Ele Edit View Favorites Tools Help								
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	Address 🕘 http://192.168.1.1/KtxRemoveElement.html/delete 🔽 🔁 Go Unks								
	KENTROX Q2300 Avaya Q2300 Testing								
	Configure > Positer > Posites								
	MONITOR         System         Show Active Routes         Show ARP Entries								
	Interfaces								
	Traffic Global Settings								
	Logs								
	CONFIGURE Data Configure								
	System Default Kouce and								
	Router Cost Configure								
	Firewall								
	VPN Static Poutos								
	Config Changed There are currently no Static Routes in the list.								
	Point Ok Cred Peoples Not Paul								

Step	Description
12.	Set the time and date.
	Select Configure $\rightarrow$ System $\rightarrow$ Time $\rightarrow$ Set Time and Date. If needed, the SNTP server
	can be selected. Follow the instructions for setting the time and date. Press Apply and
	then <b>OK</b> to continue.
	2 Q2300 - Microsoft Internet Explorer
	He Eat View Favorites Loois Help
	Address Address Address Attraction MtxSvsTimeManual html
	KENTROX Q2300 AVaya Q2300 Testing
	MONITOR         Configure > System > Time > Set Date and Time
	System Set Date and Time
	Logs Date [MM/DD/YYYY] 6 / 2006
	CONFIGURE         Time [HH:MM:SS]         9         55         57
	System
	Interfaces         Configuration Not           Refresh         OK         Cancel         Apply           Saved
	Firewall
	VPN
	QoS
	Config
	Save Now?
	Done

Step	Description	l,										
13.	Configure	the QoS Param	neters									
	Select Con	figure → QoS	\$ <b>→</b> (	QoS Si	ımmar	y. QoS i	s typica	ally per	formed	d on th	e outboun	
	side of the	router, so click	c on t	he inte	rface h	yperlink	for the	ipwan 🛛	Interf	ace.		
	Q2300 - Microso	ft Internet Explorer										
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	KENTROX	Q2300		Ava	ya Q230	0 Testing			Help	Log Out C	Inline Support	
	MONTTOR	Configure > QoS	> QoS S	ummary								
	System											
	Interfaces	QoS Summary										
	Traffic	Interface	QoS	Attached to	Bandwidth	Bandwidth Auto-	Policies	OoS Enabled		Controls		
	Logs	inlan [192 168 90 1]	IfType	Layer-2 Ves	[kbps]	Configured Ves	Configured	Vec	Interface	DscpMap	Policies	
	CONFIGURE	ipwan [192.168.75.1]	Wan	Yes	1536	No	1	Yes	Interface	DscpMap	Policies	
	System	IP-	Lan	Yes	100000	Yes	1	Yes	Interface	DscpMap	Policies	
	Interfaces	200 [192.168.200.1] IP-1 [192.168.1.1]	Lan	Yes	100000	Yes	1	Yes	Interface	DscpMap	Policies	
	Firewall									<del></del>		
	VPN	Refresh Confid	Refresh Configuration Not Saved									
	QoS				1							
	Config											
	Changed											
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Step	Description										
14.	Verify band	lwidth	n setti	ngs fe	or the <b>ip</b>	wan Inte	rface.				
	For complia	ance t	esting	g the	default v	values we	ere used.	Refer to	the K	entrox support page to	
	change thes	e setti	ings								
	Configure	$\rightarrow Q$	oS →	QoS	5 Summa	ary → C	controls a	and sele	ct the ]	Interface hyperlink for	
	the ipwan I	nterf	ace a	nd the	en <b>edit</b>						
	Q2300 - Microsof	t Internet I	Explorer								
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	KENTREX	Q2300			AV	aya Q2300	Testing			Help Log Out Online Support	
	MONITOR	Config	jure > Q	QoS > (	QoS Summary	> QoS Interf	ace Configurati	ion			
	System	0oS	Interfa	ce Confi	iguration : i	pwan eo	lit				
	Interfaces										
		QoS If	Туре	Wa	an						
	CONSTGUES	Bandw	nea to Lay vidth	<b>yer-2</b> 18: 15:	s 36 kbps						
	System	Bandw	vidth Auto	- No							
	Interfaces	Policie	s Configu	red 1						3	
	Router	QoS Er	nabled	Ye	s						
	Firewall										
	VPN	РНВ	Configu	iration :	Summary						
	QoS										
	Config	Name	Min BW	Max BW E	nable Remarking No	Remarking Type	DSCP/Precedence	Enable Shapin Yes	g Controls Show		
	Save Now?	af1	12 %	100 %	No	Dscp	10	Yes	Show		
		af2	12 %	100 %	No	Dscp	18	Yes	Show		
		af3	12 %	100 %	No	Dscp	26	Yes	Show		
		af4	25 %	100 %	No	Dscp	34	Yes	Show		
		ef	33 %	33 %	No	Dscp	46	Yes	Show		
		nc	1 %	100 %	No	Dscp	56	Yes	Show		
	ど Done									🔮 Internet	

Step	Description								
15.	Verify QoS rate limit setting.								
	Select Configure $\rightarrow$ QoS $\rightarrow$ QoS Summary and select the Interface hyperlink for the								
	ipwan Interface and then edit next to the ipwan title. Press Apply to continue. The								
	default setting of 1536 kbps was used for the compliance testing.								
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	KENTROX Q2300 Customer Location Help Log Out Online Support								
	MONITOR Configure > QoS > QoS Summary > QoS Interface Configuration > Edit QoS Interface Configuration								
	System								
	Interfaces								
	Traffic Bandwidth [kbps] 1536								
	Logs Auto-Configure Bandwidth								
	System								
	Interfaces Apply Cancel Configuration Not Saved								
	Router								
	Firewall								
	VPN								
	QoS								
	Config								
	Save Now?								
	Done								

Step	Description								
16.	Disable NAT.								
	Select Configure $\rightarrow$ Router $\rightarrow$ NAT and de-select the NAT Enable check box.								
	Press <b>OK</b> to continue.								
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	Address 🗃 http://192.168.1.1/configuration/KtxNat.html								
	KENTROX Q2300 Avaya Q2300 Testing								
	MONTTOP Configure > Router > NAT								
	System								
	Interfaces Global Settings								
	Traffic NAT Enable								
	Logs								
	System								
	IP Interface NAT Global Address NAT to DMZ Configuration Router Configuration								
	Firewall         ipwan [192.168.75.1] (Untrusted)         ipwan         Enabled          < Make Selectic ¥								
	VPN         Mapped IP         State         Global IP Addr.         Local IP Addr.         Global App./Port         Local App.         Configuration								
	QoS There are currently no Mapped IP addresses configured.								
	Config								
	Changed Refresh Ok Cancel Saved								
	🛃 Done 🥥 Internet								
	VPN       Mapped IP       State       Addr.       Local IP Addr.       App./Port       Local App.       Configuration         QoS       There are currently no Mapped IP addresses configured.       There are currently no Mapped IP addresses configured.       Image: Configuration Not Save Now?       Image: Configuration Not Saved       Image: Configuration Not Sa								

)	Description								
17.	Disable the I	OHCP server func	ction and enable DHCP Relay fu	nctionality.					
	Select Configure $\rightarrow$ Router $\rightarrow$ DHCP and click on the Configuration drop down list								
	Select Enable DHCP Relay. Once in DHCP Relay Mode, click on the Configuration								
	drop down list and select Add Remote DHCP Server. Enter the IP address of the remote								
	DHCP serve	r 10.1.2.250. Clic	k OK to continue.						
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	KENTROX	Q2300	Avaya Q2300 Testing	Help Log Out Online Support					
		Configure > Router > DHCP	> > Add Remote DHCP Server						
	System								
	Interfaces	Add Remote DHCP Server							
	Traffic	Enter IP address and security z	zone of DHCP server.						
	Logs	Remote DHCP Server 10.	1.2.250						
	CONFIGURE	Security Zone un	trusted 💌						
	Interfaces								
	Router	OK Cancel Co	onfiguration Not Saved						
	Firewall								
	VPN								
	ųos								
	Config Changed Save Now?								
1									

Step	Description				
18.	Add DHCP F	Relay	Interfaces.		
	Select Confi	gure	$\rightarrow$ Router $\rightarrow$ DHCP a	nd click on the Con	figuration drop down list.
	Select Add	DHC	P Relay Interface.	Add interfaces for	192.168.90.1 (Voice) and
	192 168 200	1 (Дя	ta)		
	1/2.100.200	1 (Du			
	an O2300 - Microsoft I	nternet Ev	nlorer		
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	Address 🕘 http://192.168	1.1.1/configur	ation/KtxAddDhcpFwInterface.html/edit		Go Links 🎽
	KENTROX	2300	Avaya Q23	300 Testing	Help Log Out Online Support
	MONITOR	Configure	e > Router > DHCP		
	System				
	Interfaces	Advanc	ed DHCP Configuration		
	Traffic		Circuit On	Configuration	
	Logs		DHCP Re	lay	<make selection=""></make>
	CONFIGURE		Remote DHCP Server Address	Security Zone	Configure
	Interfaces		10.1.2.250	untrusted	«Make Selection»
	Router		DHCP Relay In	Configure	
	Firewall		iplan [192.168.1.1]	( I rusted)	
	VPN		IP-200 [192.168.200		
	QoS		IP-90 [192.168.90.1	] (Trusted)	<make selection=""></make>
	Config Changed				
	Save Now?	Refre	sh Configuration Not Saved		
	E Done				🔮 Internet 🤢

Step	Description
19.	Save the configuration.
	Once the configuration changes are complete, save the configuration to Flash. Click on the
	RED "Config Changes Save Now?" button or Select Configure → System → Config
	Save / Restore and choose the most appropriate action. The default selection is Save
	Running Configuration to Flash.
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	Address 🗃 http://192.168.1.1/save/KtxSave.html
	KENTROX 02300 Avava 02300 Testing
	Help Log Out Online Support
	MONITOR Configure > System > Config Save / Restore
	System Configuration Save / Restore
	Interfaces
	Please select one of the operations below:
	Logs Router Flash Save / Restore Operations:
	CONFIGURE
	System from Flash
	Factory Configuration:
	Eirowall Remote File Import / Export Operations:
	C Export Running Configuration to Remote
	C Export Previously Saved Configuration to
	Remote File
	Config Configuration roll kelloce file
	Save Now?
	Configuration Not
	OK Cancel Saved
	🕘 Done 🔹 👘 Internet

# 5. Configure the Avaya C364T-PWR switch

This section shows the necessary steps in configuring the Avaya C364T-PWR switch as shown in the sample network.

Step	Description
1.	Connect to the Avaya C364T-PWR switch. Log in using the appropriate Login ID and
	Password.
	- ·
	Login:
	Password: C260.1.#
	C300-1 #
2.	Enter <b>Configure</b> mode.
	C360-1# configure
	$C_{260} 1(configure) \#$
3	Create VI ANS VIanVOICE and VIanDATA
5.	
	C360-1(configure)# set vlan 90 name vlanVOICE
	C360-1(configure)# set vlan 200 name vlanDATA
4.	Set trunking on ports 1/2 and 1/48.
	$C_{260} = 1(a \circ n figure) + a \circ t trumber 1/49 dot 1 g$
	$C_{360-1}(configure)$ # set trunk 1/40 dot1q $C_{360-1}(configure)$ # set trunk 1/2 dot1q
	cool (configure)// set trank 1/2 dotre
5.	Set port binding to port 1/48.
	C360-1(configure)# set port vlan-binding-mode 1/48 bind-to-all
6	Aggin VI ANS to ports 1/1 and 1/2
0.	Assign VLANS to ports 1/1 and 1/2.
	C360-1(configure)# set port vlan 90 1/1
	C360-1(configure)# set port vlan 200 1/2
7.	Assign Static VLAN to port 1/2.
	$C_{260} = \frac{1}{200}$
	C300-1(configure)# set port static-vian 1/2 30

### 6. Configure the Extreme Summit 300-48 Switch

This section shows the necessary steps in configuring the Summit 300-48 as shown in the sample network.

Step	Description
1.	Connect to the Summit 300-48. Log in using the appropriate Login ID and Password.
	Login: Password: Summit300-48:1 #
2.	Ensure the ports are not already configured. Use the <b>show port <port> info detail</port></b> command to check the current configuration for the port.
	Summit300-48:1 # show port 1:3 info detail
	Repeat for ports 1:4,1:5,1:17,1:18,1:19,1:20,1:21,1:22,1:24
3.	Create the Voice VLAN and interface.
	Summit300-48:31 # create vlan vlan42 Summit300-48:32 # configure vlan42 tag 42 Summit300-48:34 # configure vlan42 qosprofile QP7 Summit300-48:34 # configure vlan42 priority 7
4.	Add an IP address for the Voice VLAN, and enable IP forwarding.
	Note: subnets/VLANs will not Route unless IP forwarding is enabled for that VLAN.
	Summit300-48:34 # configure vlan42 ipaddress 192.168.42.254/24 Summit300-48:34 # enable ipforwarding vlan42
5.	Remove the default vlan for the ports.
	Summit300-48:1# configure vlan default delete ports 1:3,1:5,1:17,1:19,1:20 Summit300-48:1# configure vlan default delete ports 1:22, 1:24
6.	Assign ports to the Voice VLAN for the IP Phones.
	Summit300-48:34 # configure vlan42 add ports 1:20,1:22 tagged

Step	Description
7.	Assign ports to the Voice VLAN for Avaya IP Office and PC. Port 1:19 will be used for
	the Avaya IP Office.
	Summit300-48:34 # configure vlan42 add ports 1:17,1:19,1:48
8.	Assign Port 1:19 to <b>qosprofile QP7.</b>
	Summit300-48:34 # configure ports 1:19 qosprofile QP7
9.	Enable <b>DiffServ</b> examination on port 1:19.
	Summit300-48:34 # enable diffserv examination ports 1:19
10.	Set all ingress traffic on port <b>1:19</b> to <b>priority 6</b> .
	Summit300-48:34 # create access-mask port19pri6 port Summit300-48:34 # create access-list pri19 access-mask port19pri6 port 1:19 permit set dot1p 6
11.	Create the <b>Data VLAN</b> .
	Summit300-48:31 # create vlan vlan30 Summit300-48:32 # configure vlan30 tag 30 Summit300-48:34 # configure vlan30 qosprofile QP1 Summit300-48:34 # configure vlan30 priority 1
12.	Add the IP address for the Data VLAN, and enable IP forwarding.
	Note: subnets/VLANs will not Route unless to enable IP forwarding for that vlan
	Summit300-48:34 # configure vlan30 ipaddress 192.168.30.1/24 Summit300-48:34 # enable ipforwarding vlan30
13.	Assign ports to the Data VLAN
	Summit300-48:34 # configure vlan30 add ports 1:3,1:4
14.	Create WAN VLAN
	Summit300-48:31 # create vlan vlan240 Summit300-48:32 # configure vlan240 tag 240 Summit300-48:34 # configure vlan240 qosprofile QP7 Summit300-48:34 # configure vlan240 priority 7

Step	Description
15.	Add the IP address for the WAN VLAN, and enable IP forwarding
	Note: subnets/VLANs will not Route unless to enable IP forwarding for that vlan
	Summit300-48:34 # configure vlan240 ipaddress 192.168.240.1/30 Summit300-48:34 # enable ipforwarding vlan240
16.	Assign ports to the WAN VLAN
	Summit300-48:34 # configure vlan240 add ports 1:24
17.	Add static routes for the local corporate networks going to the remote site.
	Summit300-48:34 # configure iproute add 192.168.230.0 255.255.255.0 192.168.240.2 1 Summit300-48:34 # configure iproute add 192.168.75.0 255.255.255.0 192.168.240.2 1 Summit300-48:34 # configure iproute add 192.168.90.0 255.255.255.0 192.168.240.2 1 Summit300-48:34 # configure iproute add 192.168.200.0 255.255.255.0 192.168.240.2 1
18.	Create 10 VLAN
	Summit300-48:31 # create vlan vlan10 Summit300-48:32 # configure vlan10 tag 10
19	Add the IP address for the <b>10 VLAN</b> , and enable IP forwarding
	Note: subnets/VLANs will not Route unless IP forwarding is enabled for that vlan
	Summit300-48:34 # configure vlan10 ipaddress 10.1.2.2
	Summit300-48:34 # enable ipforwarding vlan10
20.	Assign ports to the 10 VLAN
	Summit300-48:34 # configure vlan10 add ports 1:5

### 7. Interoperability Compliance Testing

Interoperability compliance testing covered feature functionality, serviceability, and performance testing.

Feature functionality testing focused on the QoS and VLAN implementation in the Avaya/Kentrox configuration. Specifically, compliance testing verified that VoIP media and signaling traffic could be carried together with low priority data traffic on a low bandwidth link while still achieving good voice quality. Prioritization of voice traffic was achieved by

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implementing DiffServ-based QoS. Voice and data traffic were segmented in the enterprise network using VLANs.

Performance testing was conducted by generating voice calls with a bulk call generator and data traffic with a data traffic generator to simulate a converged network for a prolonged period of time. At the end of the performance test, it was verified that the network devices continued to operate successfully for small office scenarios.

Serviceability testing was conducted to verify the ability of the Avaya/Kentrox VoIP solutions to recover from adverse conditions, such as power cycling network devices and disconnecting cables between the LAN and WAN interfaces. In all cases, the ability to recover after the network has been normalized was verified.

#### 7.1. **General Test Approach**

All feature functionality test cases were performed manually. The general test approach entailed verifying the following:

- LAN/WAN connectivity between the Avaya and Kentrox products,
- Registration of Avaya IP Telephones with the Avaya IP Office,
- Verification of the DHCP relay configuration,
- VoIP calls between the corporate and the remote office sites.
- Inter-office calls using G.711 mu-law and G.729 codec sets, and conferencing, and
- Sending low priority data traffic over the WAN links and verifying that QoS directed the voice signaling and voice media to the higher priority egress queue based on the packets' DSCP value.

The performance tests were performed by generating low priority data traffic for small office scenarios over the WAN interface, and verifying that good voice quality was achieved when calls are routed over the WAN interface

#### 7.2. **Test Results**

All feature functionality, serviceability, and performance test cases passed. The Q-Series QoS implementation yielded good voice quality and no lost calls. The stability of the Avaya/Kentrox solution was successfully verified through performance and serviceability testing.

### 8. Verification Steps

This section provides the steps for verifying end-to-end network connectivity and QoS in the field from the perspective of the Q2300 router. In general, the verification steps include:

1. Verify IP communication to the following network devices and interfaces by using the ping command.

- Ping the Avaya IP Office.
- Ping the Avava IP telephones registered to the Avava IP Office.

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- Ping the DHCP server.
- 2. Verify DHCP relay on the Q-Series is functioning by confirming that the IP Telephones on the Q2300 side of the network receive their IP addresses from the DHCP server on the corporate side of the network
- 3. Check that the Avaya IP Telephones have successfully registered using the IP Office **System Monitor**. See section 9.1.
- 4. Place internal and external calls between the Digital telephone and IP telephones at each site.

## 9. Troubleshooting

### 9.1. Avaya IP Office Troubleshooting

Troubleshooting can be done on the IP Office via the IP Office System Monitor application. Log into the IP Office Monitor PC and select **Start**  $\rightarrow$  **Programs**  $\rightarrow$  **IP Office**  $\rightarrow$  **Monitor** to launch the IP Office System Monitor application. Log into the application using the appropriate credentials.

To see the registration messages going to and from IP Office, select **Trace Options** under the **Filters** Menu. Select the **H.323** tab and configure as illustrated below.

All Settings		×				
Key/Lamp LDAP PP	P   R2   Routing   SNMP   System   T1   VPN	WAN ]				
ATM Call DTE	EConf Frame Relay GOD H.323 Interface	ISDN				
Events						
₩ H.323						
Packets						
LH 245 Cand	H.323 Send					
H.245 Senu	H.323 Receive					
I H.245 Receive	H.323 FastStart					
🔽 RAS Send	CCMS Send					
RAS Receive	CCMS Receive					
View Whole Packet						
Trace Colour						
Default All Clear	All Tab Clear All Tab Set All OK Ca	ancel				

### 9.2. Miscellaneous Troubleshooting

- 1. If the voice quality is poor, check the QoS configuration in the Q2300 browser interface in section 4.13.
- 2. If a Q2300 router is unable to communicate with any of the aforementioned IP devices and interfaces, check the routing and status of the Ethernet and WAN interfaces through the Q2300 browser interface in section 4.3.

## 10. Support

For technical support on the Kentrox Q-Series routers, contact Kentrox Technical Support using any of the following options:

- Toll-free: (800) 733-5511
- Direct: (503) 643-1681
- Email: <u>care@kentrox.com</u>

# 11. Conclusion

These Application Notes describe the configuration steps required for integrating the Kentrox Q-Series Q2300 Router into a small office and/or low traffic/bandwidth Avaya IP Office infrastructure. For the configuration described in these Application Notes, the Q-Series router was responsible for enforcing QoS using Differentiated Services. The Avaya IP Offices delivered the voice traffic to the routers for transmission over the WAN together with data traffic. Good voice quality was successfully achieved in the Avaya/Kentrox configuration described herein.

## 12. Additional References

This section references the Avaya and Kentrox product documentation that are relevant to these Application Notes.

The Avaya product documentation can be found at: <u>http://marketingtools.avaya.com/knowledgebase/</u>

The Kentrox product documentation can be found at: <u>http://www.kentrox.com/products/Q2300/</u>

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