

LiveAction Training Lab Workbook Pt.2

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IMPORTANT INFORMATION – Please Read!

The step-by-step Labs in this Workbook have been written specifically for the LiveAction Training Student Pod, documented herein. All "Pods" have been pre-configured with the appropriate software and generated traffic to successfully perform these labs. Pay attention to any Notes presented as:

Note: This is a note example which gives additional information to the specific context.

The Diagrams, or screen shots, throughout this Workbook are *examples* for demonstration purposes and may not reflect the appropriate parameters for the classroom and/or your specific subnet. Unless specifically directed to do so, do not attempt to match the settings displayed in the screen shots to your configuration.

Traffic collected by your assigned Pod may not be synchronized with other Student Pods, and in some cases... due to specific application traffic timing, may not display the exact result specified in the Labs. The main intent is to know HOW to access the information... not to attain specific lab results.

Throughout this document *italics*, **bold** fonts, and words in CAPS, are used to place emphasis on specific procedures or results.

Lab.0

Lab 0: Setup and Get Connected

Lab 0.1: Connect to the Lab Network

For this class, each attendee or Student will connect to and manage their own LiveNX installation. In this lab you will connect to the classroom lab environment. In some locations you may first be asked to connect your laptop to the Internet.

Your instructor will assign a dedicated environment or "Pod" to each Student, and may provide you with a handout containing connectivity information specific to your Pod. Each Pod has the LiveNX Server and Client pre-installed, with some initial configuration already performed. Each Student will manage:

Local:

1 x PC Workstation to be used as a Management PC (Your Laptop)

1 x Installed LiveNX Client

1 x Browser

Remote Student Pod

1 x Windows Workstation accessed via RDC (optional) with an installed LiveNX Client and Browser

1 x LiveNX OVA Linux install

1 LiveNX Server

1 LiveNX Node (installed on LiveNX Server)





In the diagram above your workstation is connected over the LAN or WAN to your assigned Training Pod resources.

Note: Make sure to consult the Infrastructure Diagram, as well as specific classroom instructions for names, IP addresses, and other parameters. The screen shots in this Lab Workbook are *examples* which may NOT reflect the appropriate parameters for the classroom and/or your specific subnet.

Each student is provided with login credentials to our Training Lab Website, which includes connection information as illustrated below. Your Instructor may provide additional class-specific addressing and credentials. You may wish to Bookmark this Web Page, or *Make a written note* of this information for later reference.

Learning Labs Menu	3	Lab Status :	READY		Time L	eft : 8 DAYS 4 HOURS		
න් Overview		Topology	Lab Details					
Labs Introduction		SI No	Role	Hostname	Username	Password	IP Address	Port
Access Devices		1	Liveaction	livenx	admin	Student	35.231.127.249	443
Access Devices		2	B1-HQ	HQ-B1	admin	C1sco12345	35.231.127.249	20019
		3	inet1	INET1	admin	C1sco12345	35.231.127.249	20018
		4	inet2	INET2	admin	C1sco12345	35.231.127.249	20020
		5	inet3	INET3	admin	C1sco12345	35.231.127.249	20021
		6	BR1	Branch1-LA	admin	C1sco12345	35.231.127.249	20001
		7	B2-HQ	HQ-B2	admin	C1sco12345	35.231.127.249	20022
		8	MPLS1	MPLS1	admin	C1sco12345	35.231.127.249	20010
		8	MPLS2	MPLS2	admin	C1sco12345	35.231.127.249	20009
		9	BR2	Branch2-NY	admin	C1sco12345	35.231.127.249	20000
		10	wkst1	Administrator	Administrator	C1sco12345	35.231.127.249	20201
		11	Activedirectory	Administrator	Administrator	C1sco12345	35.231.127.249	20202
		12	PC1	Administrator	Administrator	C1sco12345	35.231.127.249	20203
		13	PC2	Administrator	Administrator	C1sco12345	35.231.127.249	20204

Lab Steps:

- 1. Connect your workstation to the Management Network with an Ethernet cable (or, if available, connect to the Wireless network per the instructions provided by your instructor).
- 2. Verify connectivity to the Internet by opening a browser to <u>www.liveaction.com</u>.

Note: Make sure to consult the Infrastructure Diagram and worksheets, as well as specific classroom instructions for names, IP addresses, and other parameters. The screen shots in this Lab Workbook are *examples* which may not reflect the appropriate parameters for the classroom and/or your specific subnet.

Lab 0.2: Connecting to Your Training Pod

Throughout this Lab Workbook, you will be directed to connect to your Pod resources... use the IP Address & Port information provided in your assigned Web connection document.

The instructor will have emailed credentials/login information to you prior to the start of the Training Session... similar to that below...

DIAGRAM



Lab Steps:

1. Click the URL provided in the email.

Note: If clicking-on the URL does not automatically launch your default browser you may need to copy the URL to your browser address bar.

- 2. Enter the Username & Password as provided in the email.
- 3. Tick the "Terms of Service" box.
- 4. Click Enter.
- 5. In the Learning Labs menu click Access Devices to display your Lab Details.

Learning Labs Menu	Lab Status :	✓ READY		Time Le	2 DAYS 17 H	OURS	
🗙 Overview	Торо	ogy Lab Details					
Labs Introduction	SI No	Role	Hostname	Username	Password	IP Address	Port
	1	Liveaction	livenx	admin	Student	104.196.66.177	443
Access Devices	2	B1-HQ	HQ-B1	admin	C1sco12345	104.196.66.177	20019
	3	inet1	INET1	admin	C1sco12345	104.196.66.177	20018
	4	inet2	INET2	admin	C1sco12345	104.196.66.177	20020
	5	inet3	INET3	admin	C1sco12345	104.196.66.177	20021
	6	BR1	Branch1-LA	admin	C1sco12345	104.196.66.177	20001
	7	B2-HQ	HQ-B2	admin	C1sco12345	104.196.66.177	20022
	8	MPLS1	MPLS1	admin	C1sco12345	104.196.66.177	20010
	8	MPLS2	MPLS2	admin	C1sco12345	104.196.66.177	20009
	9	BR2	Branch2-NY	admin	C1sco12345	104.196.66.177	20000
	10	wkst1	Administrator	Administrator	C1sco12345	104.196.66.177	20201
	11	Activedirectory	Administrator	Administrator	C1sco12345	104.196.66.177	20202
	12	PC1	Administrator	Administrator	C1sco12345	104.196.66.177	20203
	13	PC2	Administrator	Administrator	C1sco12345	104.196.66.177	20204

Lab 1

Lab 1: QoS Configuration

Lab 1.0: Introduction to QoS

In this lab we are going to walk through the story of implementing QoS for a small WAN network using LiveNX. When complete we will have used LiveNX to:

- Identify and validate critical traffic is marked with a DSCP tag
- Build Shaping Policies
- Prioritize Voice & Video
- Protect high priority data
- Police scavenger/low priority traffic
- Validated QoS is working end-to-end

Below is a diagram of sample network. There are three WAN locations. Each location has fullmesh connectivity provided by a MPLS network. The connectivity is designed as follows:

- HQ no provider CIR
- NY 1.544Mb provider CIR
- LA 1.544MB provider CIR

For the sake of this lab assume there is no other QoS on the service provider's backbone.



Remember from the presentation that QoS is done in 4 steps:

- Step 1 Recognizing Application traffic (Classification and Marking)
- Step 2 Prioritization (Queueing and Shaping)
- Step 3 Throttling Traffic (Policing and WRED)
- Step 4 Buffer Tuning

We will use LiveNX to walk through this story.

Remember from the slide presentation there are several components to this step.



Day 0 Tasks

The first item that must be understood to successfully implement QoS is to understand a business's critical applications. In our sample network the following applications have been defined as the highest priority:

- Voice (rtp)
- Video (Lync)
- SIP
- Citrix
- NetFlow
- SNMP
- SSH
- Telnet
- Salesforce

We will next use several LiveNX Flow reports to understand the application landscape

Lab 1.1: Run Baseline Reports

- 1. From the LiveNX Client, Run the Reports > Flow > Applications > Application
 - a. Keep all filters and report at their default settings
 - b. Implement a Search of "wan"
 - c. Execute Report



Notice that this report is looking at All Devices and all outbound Interfaces tagged with WAN.

Review the applications on the network – all business critical applications are represented. Notice voice (rtp) & video (openwebnet) are top applications by volume in this network – this is often not the case in real networks.

This provides a good general breakdown of the overall usage of the business critical on the WAN network as a whole

- 2. Run the Reports > Flow > Network > Interface Bandwidth Summary Report
 - a. Keep all filters and report at their default settings
 - b. Implement a Search of "wan"
 - c. Execute Report

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This will provide an understanding of each sites' overall WAN utilization.

3. Re-run this report, but update the Search to: "wan & flow.app=rtp"

This provides an understanding of the utilization of just Voice (rtp) on each WAN circuit.

4. Re-run this report, but update the Search to: "wan & flow.app=openwebnet"

This provides an understanding of the utilization of just Video (Lync) on each WAN circuit.

- 5. Re-run this report, but update the Search to view other key applications as desired.
- 6. Run the Reports > Flow > Address > Site Traffic
 - a. Keep all filters and report at their default settings
 - b. Implement a Search of "wan"
 - c. Execute Report



Observe the breakdown of bandwidth between site pairs.

7. Re-run this report, but update the Search to: "wan & flow.app=rtp"

This provides an understanding of just Voice (rtp) on for the site pairs.

- 8. Re-run this report, but update the Search to view other key applications as desired.
- 9. Run the Reports > Flow > Address > Destination Site Traffic
 - a. Keep all filters and report at their default settings
 - b. Implement a Search of "wan"
 - c. Execute Report



Observe which sites are being sent the most data.

10. Re-run this report, but update the Search to: "wan & flow.app=rtp"

This provides an understanding of which sites are receiving the most Voice (rtp).

- 11. Re-run this report, but update the Search to view other key applications as desired.
- 12. Run the Reports > Flow > Address > Source Site Traffic Report
 - a. Keep all filters and report at their default settings
 - b. Implement a Search of "wan"
 - c. Execute Report

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Observe which sites are sending the most data.

13. Re-run this report, but update the Search to: "wan & flow.app=rtp"

This provides an understanding of which sites are sending most Voice (rtp).

14. Re-run this report, but update the Search to view other key applications as desired.

After running these reports we now have a good understanding of how the network is being utilized. We also know per application the breakdown of bandwidth utilization per site.

We will want keep this understanding in mind as we continue through the lifecycle of the QoS project and beyond.

Lab 1.2: Building Filters

The reports we have used so far were using NBAR for recognizing specific types of traffic such as Voice (rtp) or Video (Lync). This can be an excellent way to see specific applications that are known by NBAR. In real networks though, NBAR is a great, but not a perfect solution for recognizing traffic. Often, one may see multiple different NBAR definitions for the same type of application (cisco-phone-audio and cisco-jabber-audio) if no NBAR Protocol Pack standardization has occurred or NBAR will return unknown results if Protocol Packs are old.

To overcome these challenges with recognizing specific applications of interest, LiveNX Filters provide an excellent way to administratively define application definitions. As an example, we are now going to build a filter in LiveNX that could be used for recognizing a **Cisco CallManager IP Phone system**. This is just one example. In a real network the concepts presented should be repeated for other applications of interest on the network.

Lab Steps:

1. From the LiveAction map, select the **Flow** Tab



2. To Edit or Create a filter, click the 🖾 icon from the options at the top of the map:

3. The Display Filters Setup Dialog appears

A Flow Display Filters Setup	X
🌠 Create Filter 😽 Copy 🏹 Delete 🙀 Rename	Filter Entry Details
Filter: *DefaultFilterGroup	Filter Entry Action:
Filter Entries	IP Type: IP V4 Only C IP V6 Only C Both IP V4 & IP V6
Add Entry Add Other Filter Remove Reference So	Color Mapping Label & Color: Web
· · · ·	Basic Advanced
Yolco PefaultFilterGroup DefaultFilterGroup Enternet Image: Internet Image: Internet Image: Image	Match Protocol/Ports Select from a pre-defined list of protocols/applications or create new definitions definitions definitions definitions definitions
	Match IP, Range, Subnet Source: Destination: Enter IP addresses, ranges, and/or subnets separated by spaces (e.g., 172.120.0.1 192.168.0.0/24 10.0.0.1-10.100.0.1) Match DSCP X
Note: Other filters added as entries are not editable here, but can be edited by selecting them in the Filter drop-down box.	Match Device Interface Match flows traversing through a particular device's interface Match flows traversing through a particular device's interface
Hep	OK Cancel Apply

4. In the Filter selection pull-down, select the Voice Filter

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Flow Displanaters Setup	
🖕 Create Filter 🖙 Copy 🏹 Delete 🚮 Rename	Filter Entry Details
ter: Voice	Filter Entry Action: Show or Hide the following
	IP Type: IP v4 Only IP v6 Only Both IP v4 & IP v6
r Entries	Color Mapping Label & Color: Skinny
Add Energy 🕒 Add Other Filter 🔹 Delete Entry 🔹 🚯	Basic Advanced
Voice [VoIP] Show IPv4 Only (Prot/App=voip)	
[VoIP] Show IPv4 Only (Prot/App=volp) [Skinny] Show IPv4 Only (Prot/App=skinny)	▼ Match Protocol/Ports
[Ventrilo TCP] Show IPv4 Only (Prot/App=ventrilo tcp)	Select from a pre-defined list of protocols/applications or create new definitions
Ventrilo UDP] Show IPv4 Only (Prot/App=ventrilo udp) [H323] Show IPv4 Only (Prot/App=h323)	skinny 👻 🔶 Create 🧷 Edit 🗅 Copy
[RTP] Show IPv4 Only (Prot/App=rtp)	
[SIP] Show IPv4 Only (Prot/App=sip)	
	Match IP, Range, Subnet
	Match IP Addresses Regardless of Source or Destination
	Source:
	Destination:
	Enter IP addresses, ranges, and/or subnets separated by spaces (e.g.,
	172.120.0.1 192.168.0.0/24 10.0.0.1-10.100.0.1)
	Match DSCP
	0 (BE)
	Match Device Interface
	Match flows traversing through a particular device's interface
	*7609_143.referentia.com 💌 *EOBC0/0 💌
- No. 11 Control of the second s	
e: Other filters added as entries are not editable here, but can be edited by selecting them in the bodown box.	ne Filter 🖉 Thound and Outbound 🔿 Inbound 🔿 Outbound
Help	OK Cancel App
iep	OK Cancel App

In its default form, the **Voice** filter is not built for any specific Vendor's solution. We will modify this filter to make it useful in a **Cisco CallManager** environment. We will **Delete**, **Add**, and **Edit** the entries of the filter.

Filter Entry Details Filter Entry Action:
IP Type: IPv4 Only C IPv6 Only C Both IPv4 & IPv6 Color Mapping Label & Color: Basic Advanced For Match Protocol/Ports Select from a pre-defined list of protocols/applications or create new definitions skinny Image: Create @ Edit Copy Image: Skinny Image: Create @ Edit Copy
Color Mapping Label & Color: Skinny Basic Advanced Match Protocol/Ports Select from a pre-defined list of protocols/applications or create new definitions skinny Skinny
Basic Advanced Final Match Protocol/Ports Select from a pre-defined list of protocols/applications or create new definitions Skinny Create Create Copy Skinny
Watch Protocol/Ports Select from a pre-defined list of protocols/applications or create new definitions skinny Skinny skinny skinny
Watch Protocol/Ports Select from a pre-defined list of protocols/applications or create new definitions skinny Skinny skinny skinny
Select from a pre-defined list of protocols/applications or create new definitions skinny
skinny 💽 💠 Create 🖉 Edit 🗋 Copy
Skinny
J
Match IP, Range, Subnet
Match IP Addresses Regardless of Source or Destination
Source:
Destination:
Enter IP addresses, ranges, and/or subnets separated by spaces (e.g.,
172.120.0.1 192.168.0.0/24 10.0.0.1-10.100.0.1)
Match DSCP
0 (BE)
Match Device Interface
Match flows traversing through a particular device's interface
*7609_143.referentia.com
© Inbound and Outbound C Inbound C Outbound
<u></u>

- 5. To delete unused Entries simply select it and click **Delete Entry** above the list of entries.
 - a. Delete VoIP
 - b. Delete Ventrilo TCP
 - c. Delete Ventrilo UDP
- 6. To add and entry simply click Add above the list of entries.

Note: The following filters may already be present in the Training Pod. Name your new filters with your name or initials.

- 7. Name it MGCP
- 8. Tick "Match Protocols/Ports"
- 9. In the dropdown, select MGCP

Filter Entry Action	n: 💿 Show or 🔿 Hide the following
IP Type: 💿 IPv4	Only C IPv6 Only C Both IPv4 & IPv6
Color Mapping La	bel & Color: MGCP 📃 💌
asic Advanced	
Match Protocol	/Ports
Select from a pre-defi definitions	ined list of protocols/applications or create new
mgcp	🔽 🕞 Create 🧷 Edit 🗅 Copy
	=TCP) AND (Src OR Dst=2427 OR 2428 OR 2727) =UDP) AND (Src OR Dst=2427 OR 2727)
	=00P) AND (SPL OR DSL=2427 OR 2727)
,	
_	
Match IP, Range	e, Subnet
	e, Subnet Regardless of Source or Destination
Match IP Addresses	Regardless of Source or Destination
Match IP Addresses Source: Destination: Enter IP addresses, r	Regardless of Source or Destination
Match IP Addresses Source: Destination: Enter IP addresses, r 172.120.0.1 192.16	Regardless of Source or Destination
Match IP Addresses Source: Destination: Enter IP addresses, r 172.120.0.1 192.16 Match DSCP	Regardless of Source or Destination
Match IP Addresses Source: Destination: Enter IP addresses, r 172.120.0.1 192.16	Regardless of Source or Destination
Match IP Addresses Source: Destination: Enter IP addresses, r 172.120.0.1 192.16 Match DSCP	Regardless of Source or Destination
Match IP Addresses Source: Destination: Enter IP addresses, r 172.120.0.1 192.16 Match DSCP 0 (BE) Match Device Ir	Regardless of Source or Destination
Match IP Addresses Source: Destination: Enter IP addresses, r 172.120.0.1 192.16 Match DSCP 0 (BE) Match Device Ir	Regardless of Source or Destination
Match IP Addresses Source: Destination: Enter IP addresses, r 172.120.0.1 192.16 Match DSCP 0 (BE) Match Device Ir Match flows traversin *Branch1-LA.dcloud.	Regardless of Source or Destination

Edit Entries the following entries with these updates:

H323 - TCP/UDP = Src or Dst = 1718 1719 1720

SIP - TCP/UDP = Src or Dst = 5060 5061 5062

RTP - UDP = Src AND Dst = 16384-32767

A Flow Display Filters Setup	X
🏹 Create Filter 🤯 Copy 🏹 Delete 📆 Rename Filter: Voice	Filter Entry Details Filter Entry Action: © Show or C Hide the following
Filter Entries	IP Type: IP V4 Only C IPv6 Only C Both IPv4 & IPv6 Color Mapping Label & Color: RTP Image: Color Action Action Color Action Action Color Action Action Color Action
Voice Skinny] Show IPv4 Only (Prot/App=skinny) (H323] Show IPv4 Only (Prot/App=h323) (RTP] Show IPv4 Only (Prot/App=rtp)) (SIP] Show IPv4 Only (Prot/App=sip) (MGCP] Show IPv4 Only (Prot/App=mgcp)	Basic Advanced Match Protective orcs Sector from a pre-defined list of protocols/applications or create new definitions rtp
1 1	A Protocols/Applications Setup
	🕂 Create Definition 🗈 Copy 💥 Delete 💹 Rename
	Defined Protocols/Applications: rtp
	Entries Add Entry Add Defined Prot/App Delete rtp (L4 Protocol=UDP) AND ((Src=16384-32767) AND (Dst=16384-32767) by spaces (e.g., by spaces (e.g., but can be edited by selecting them in the drop-down box above.
	Entry Details
	Layer 4 Protocol: UDP (17)
Note: Other filters added as entries are not editable here, but ca drop-down box. Help	Match Source and Destination Ports Source: 16384-32767 Destination: 16384-32767 Enter port numbers or ranges separated by spaces (e.g., 80 88-443)
	Help OK Cancel

10. When finished, you should have something that looks like the following:

- a. MGCP TCP/UDP = Src **OR** Dst = 2427 2727 & TCP = Src or Dst = 2428
- b. H323 TCP/UDP = Src **OR** Dst = 1718 1719 1720
- c. SIP TCP/UDP = Src **OR** Dst = 5060 5061 5062
- d. RTP UDP = Src AND Dst = 16384-32767

Note: This updated voice filter will work well for our Lab purposes, but in a real networks, it would probably be best to also include IP addresses and/or subnets to these filters for eliminating any false positives.

Lab 1.3: Validating Filters

The example Filter we created should show us the Voice traffic in our network. The following reports will allow us to confirm the traffic.

Lab Steps:

1. From the LiveNX Client map, select the Flow Tab



2. From the options at the top of the map, select the following settings



You should be presented with a Flow visualization similar to the following diagram



Confirm in the legend there is Voice traffic being matched. You should see RTP & SIP being matched.

Color Mapping By Display Filter Colors



- 3. Run the Miscellaneous > User Filter report
 - a. Select the Voice filter, but leave all parameters at their default settings
 - b. Implement a Search of "wan"
 - c. Execute Report



Notice that this report is looking at All Devices and All Interfaces in the outbound direction, but specifically "WAN" interfaces. This will show the volume of bandwidth of the matched applications in the Voice filter

- 4. Run the Reports > Flow > Applications > Application report
 - a. Select the Voice filter, but leave all parameters at their default settings
 - b. Implement a Search of "wan"
 - c. Execute Report



Notice that this report is looking at All Devices and All Interfaces in the outbound direction, but specifically "WAN" interfaces.

Review the applications matching the Voice Filter. Notice how NBAR sees voice (rtp), sip and video.

Is this right? Shouldn't we just see Voice (rtp and sip) in this report?

- 5. Run the Reports > Flow > Analysis > IPs and Ports report
 - a. Select the Voice filter, but leave all parameters at their default settings
 - b. Implement a Search of "wan"
 - c. Execute Report

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Notice the ports for Lync and rtp are in the same range of 16384-32767.

Note: In a real network, we would want to work with the various system owners and assign unique port ranges if possible. But in this example we can use LiveNX's Filter and Search to help identify both types of traffic.



6. Re-run this report, but update the Search to: "wan & (flow.app=rtp | flow.app=sip)".

Notice LiveNX provides the ability to focus on just the traffic of interest!

Note: In a real world scenario we would repeat these steps for each of the business critical applications to ensure LiveNX has Filters to accurately identify the traffic.

Lab 2

Lab 2: Classification & Marking

Lab 2.1: QoS Class Models

Now that we have used LiveNX's Filter and Search capabilities to accurately identify and understand the business critical traffic, we need to assign DSCP markings (QoS tags) on the traffic. In this lab, we are going to use the following 5 class QoS model:

Class Type/Name	5 Class Model	Business Critical Traffic
Voice	EF (46)	rtp
Video	AF41 (34)	openwebnet
High Priority Data	AF31	SIP, SNMP, NetFlow, SSH, Telnet, Citrix, Salesforce
Scavenger	CS1 (8)	Unknown yet
Best Effort	BE (0)	n/a

We need to now update the legends in LiveNX to understand these selected DSCP values of interest.

Lab Steps:

1. From the LiveNX Client, select the Flow Tab

Qo5 Flow	Routing	IP SLA	LAN			
🕂 🔶 🔶	-		Table	🔁 Refresh		
Search Example: (site = Honolulu site = Chicago) & wan &						

2. From the options at the top of the map, select the 🗗 icon:



- 3. Set the Attribute to DSCP
- 4. Update the values to match those selected for the lab's 5 class QoS model.

Color Mapping	×
Select an attribu each value.	te to remap the flow colors. Click the color swatch to modify the color for
Attribute DSCP	×
Select a DSCP v	value from the drop-down lists below
DSCP	0 (BE)
DSCP	18 (AF21)
DSCP	26 (AF31)
DSCP	34 (AF41)
DSCP	8 (CS1)
DSCP	24 (C53)
DSCP	32 (CS4)
DSCP	48 (C56)
DSCP	46 (EF)
📕 (Remaining	0
	OK Cancel

Lab 2.2: Validate DSCP Markings

Now that we have selected our QoS model, we should validate if any DSCP values are already being used.

1. From the LiveAction map, select the Flow Tab



2. From the options at the top of the map, select the following options

All Flow Types 🛛 💌	Current Time 💌	Current Polling Interval 🔽 🖙 Voic	e 🔽 Top 50 💌 🗗	DSCP 🔽

You should be presented with a Flow visualization *similar to* the following diagram



3. Confirm in the legend what DSCP values are seen.

Color Mapping By DSCP



Since we have the Voice Filter in place, we would hope to only see EF and/or AF31 per the 5 Class QoS model that was chosen for this network. Because there are more values seen, we will further narrow the scope of the filter.

4. Update the Search to "flow.direction=Egress"

Q05	Flow	Routin	ig (IP SLA	LAN
🕂 🕂 🖑 🖊 🗐 🔹 🔍 Table					
Search flow.direction=Egress					

Notice that all traffic leaving LA is DSCP 0(BE) (light blue). That is definitely not correct.



Note: In subsequent labs the traffic specified in these labs may NOT be available due to timing of the replays, or traffic availability. You may try looking for alternate types of traffic. The intent of these labs is to demonstrate the settings and *process* for using filters, not necessarily the specific traffic found.

We'll use LiveNX Client reports to investigate further.

- 5. Run the Reports > Flow > QoS > **DSCP** report
 - a. Select the Voice filter, but leave all parameters at their default settings
 - b. Implement a Search of "wan"



c. Execute Report

Notice that this report is looking at All Devices and All Interfaces in the outbound direction, but specifically "WAN" interfaces. This report is good to show the overall bandwidth of Voice traffic in the network and the percent of Voice bandwidth that is / is not marked as desired.

- 6. Run the Reports > Flow > QoS > User Filter > DSCP Audit report.
 - a. Select the Voice filter, but leave all other parameters at their default settings
 - b. Implement a Search of "wan"
 - c. Execute Report



Notice that this report is looking at All Devices and All Interfaces in the outbound direction, but specifically "WAN" interfaces. It is showing the Source Site, the Filter match, and the DSCP value of the match.

Make note of the DSCP values, especially where you see 0 (BE). We will need to implement/fix the QoS at these sites.

Remember how the ports for Lync and rtp are in the range of 163840-32767. This means that they will both show as RTP here. We would hope to see both 46(EF) and 34 (AF41) for RTP. It is good we already see some of this, but we need to make this better.

- 7. Run the Reports > Flow > QoS > Application DSCP Audit report.
 - a. Select the Voice filter, but leave all parameters at their default settings
 - b. Implement a Search of "wan"
 - c. Execute Report

LiveAction Lab Workbook Pt. 2



Notice that this report is looking at All Devices and All Interfaces in the outbound direction, but specifically "WAN" interfaces. It is showing the Source Site, the application name as learned from NBAR, and the DSCP value of the match.

Make note of the DSCP values, especially where you see 0 (BE). We will need to implement/fix the QoS at these sites.

Also note where Video (MS-Lync) is showing as 46(EF).

Note: After validating the DSCP values using the Voice Filter, you would want to create more filters for the other priority applications of the network and repeat these steps.

Lab 2.3: Rogue DSCP Markings

We will also want to ensure that any non-priority traffic is not accidently or maliciously given a high priority DSCP value.

Lab Steps:

PDF

Help

Export to CSV

- 1. Run the Reports > Flow > Analysis > IPs and Application report.
 - Select No Display Filter, but leave all parameters at their default settings a.
 - Implement a Search of "wan & flow.dscp=EF" b.
- **Execute Report** c. Flow Reports IPs and Application Q- ip - Reports -An alveis **IPs and Application** 15m 1h 6h 1d 1w 30d Custom IPs and Port ICC All Devices All Interfac nber of flows: 177 Utilize Long Term Cache Ni Filter Voice Graph Basic Flow Time S Bit Rate Outbound Search wan & flow.ds 200 Kbps Bit Rate 100 Kpps 0 bps Sep 21, 06:35 AM Sep 21, 06:37 AM Sep 21, 06:39 AM Sep 21, 06:41 AM Sep 21, 06:43 AM Sep 21. 06:45 AM Sep 21, 08:47 AN Date Report Actions Save Ghow Total Bit Rate Save As Q, Number of datasets: 10 Create Average Bit Rate Src IP Addr Src Site Dst IP Addr Dst Site DSCP Application Total Bytes Total Packets Average Packet Rate Peak Bit Rate Edit ✓ 198.19.1.84
 ✓ 198.18.128.84
 ✓ 198.19.1.81
 ✓ 198.19.1.80 LA 198.18.128.84 Internet LA 46 (EF) rtp-audio 14 13 5 MB 27,266 48.47 Kbps 44.83 Kbps 30.30 pps 53.01 Kbps 4 Internet LA LA Delet 198.19.1.84 46 (EF) rф 5 MB 25,215 28.02 pps 57.81 Kbps 198.18.128.81 46 (EF) rtp-audio 2 MB 16,019 17.62 Kbps 17.80 pps 21.72 Kbps Schedule rtp-audio rtp rtp openwebnet

Notice the applications listed in this report.

198.19.1.80

198.18.128.81 Internet

98.18.128.81

198.19.120.01 Internet 198.19.1.81 LA 198.19.1.80 LA

198.18.128.80

198.19.1.81 198.19.1.80 LA LA

198.18.128.81

198.18.128.80 198.19.1.81

Internet 46 (EF)

Internet

46 (EF)

46 (EF)

46 (EF) 46 (EF) 46 (EF)

openwebnet

We would hope to only see Voice (rtp) listed in this example. Anything else needs to be fixed via an update to the networks QoS policies.

2 MB

2 MB

2 MB

355 КВ 332 КВ

332 KB

15,455

14,740

14,472

478 447

17.00 Kbps

16.22 Kbps

15.92 Kbps

3.16 Kbps

2.95 Kbps

2.95 Kbps

17.17 pps

16.38 pps

16.08 pps 0.53 pps 0.50 pps

0.50 pps

20.91 Kbps

22.82 Kbps

21.32 Kbps

6.47 Kbps

4.07 Kbps

We would want to re-run this same type of report but update the Search with the DSCP values of the other priority applications in the network.

×

× -

33 pps

36 pps

21 pps

21 pps

23 pps

21 pps

0 pps 1 pps

Lab 2.4: Configure Classification & Marking Policies

Now that we understand the traffic of the network and the DSCP values that should be marked on each type of traffic, we can use LiveNX to implement the correct QoS policies to the traffic on the routers.

We will create a template QoS policy and apply this to the LAN interface of each of the routers to classify and mark the priority traffic properly.

Lab Steps:

1. From the LiveAction map, select the QoS Tab



2. Right-click on the HQ router, select QoS > Manage QoS Settings



Manage QoS Settings - HQ-SJ.dcloud.cisco	o.com (198.18.129.25) 🛛 🗙
2 2 2 2 2 2 2	
Policies Classes Interfaces	
Policies	Mapped Classes
📑 🖲 🗟 🚠 着 🖏 📑	
E	Class Name Classify Marking Queueing Policing Shaping Compression WRED DBL Unknown
	Mapped Class Detail
	Drop all traffic for class
	Classify Marking Queueing Policing Shaping Compression WRED DBL Unsupported
	Match on: Any Reference
	Class is defined by the criteria show at left.
	Match-any: packet must meet at least one of the criteria to be a member of the class.
	Match-all: packet must meet all criteria to be a member of the class.
	Edit
Help	Save to Device Preview CLI Close

- 3. Select the Add Policy 📑 icon.
- 4. In the Add Policy dialog, enter the name "SET_DSCP_LAN"



You can now see the new policy with its class-default appearing in the Policies list.

Policies Classes Interfaces
Policies
🛃 🛈 🕱 🔝 🔚 🕼 🖏 🕫
EIVEACTION-POLICY-UNIFIED SET_DSCP_LAN class-default

5. Right>Click on the SET_DSCP_LAN policy and select Add Class to Policy

EIVEACTION-POLICY-UNIFIED				Clas	s Name	Class	sif
E Class-defa		Copy Policy			J_CIL	-	,
		Delete Policy					
		Add Class to Policy					
	<u></u>		6	_			
	2	Apply Policy to Interi			_		
	-	Remove Policy from	Ince	errace			

6. Select the Create new class option and name the new class SET_DSCP_VOICE



You will see the new class SET_DSCP_VOICE appear under the SET_DSCP_LAN policy

Manage QoS Settings - HQ-SJ.dcloud.cisc	o.com (198.18.129.25) 🛛 🛛 🗙
2 2 2 2 2 2 2	
Policies Classes Interfaces	
Policies	Mapped Classes
🔁 🖲 🗟 🛼 🐁 🗞	
E IVEACTION-POLICY-UNIFIED	Class Name Classify Marking Queu Policing Shap Compre WRED DBL Unk
ET_DSCP_LAN	SET_DSCP_VOICE
Class-default	class-default •
	Mapped Class Detail
	Crop all traffic for class
	Classify Marking Queueing Policing Shaping Compression WRED DBL Unsupported
	Match on: Any Reference
	Class is defined by the
	criteria show at left.
	Match-any: packet must
	meet at least one of the
	criteria to be a member of
	the class.
	Match-all: packet must
	meet all criteria to be a
	Edit member of the class.
Help	Save to Device Preview CLI Cancel

7. On the Classify Tab, select the Edit button

🛕 Manage QoS Setti	ngs – HQ-SJ.dcloud.	cisco.com (198.18.129.25))			×
4 A A	a 🗞 🔍					
Policies Classes Inte	rfaces					
Classes	Create and Edit Mal	tch Statements				
<u></u>	Match type:	Cos		•	Match any 💌 💘	
LIVEACTION-CLASS	Value:	0			M Match T	Value
LIVEACTION-CLASE		1 2 3 4 5 6 7 (Select up to 4 values)	Replace Match	I Statement	M Match T	Value
Help			_	Save to Device	Preview CLI	Cancel

8. Select the Match Type dropdown and select Protocol – using NBAR

Policies Classes Inte	erfaces	
Classes	Create and Edit Mat	ch Statements
🔁 🗈 🕺	Match type:	cos
LIVEACTION-CLASS	Value:	Any
LIVEACTION-CLASS		ACL Name
SET_DSCP_VOICE		ACL Number
		Class
		cos
		DSCP
		Frame relay DE bit
		Frame relay DLCI
		RTP Protocol - using NBAR
		HTTP Protocol - using NBAR
	Match/match not:	· · · · · · · · · · · · · · · · · · ·
		MAC Destination Address MAC Source Address
		MPLS experimental topmost Packet length
		Protocol - using NBAR
		Protocol - using NBAR groups
		QoS group
		Kon Broch
9. Select the value of **rtp** and click **Add Match** Statement. The protocol rtp will appear in the window at the far right of the window.

Policies Classes Inte					
Classes	Create and Edit Mat	ch Statements			
🔒 🖬 💥	Match type:	Protocol - using NBAR	•	Match any 💌 😻	
LIVEACTION-CLASS	Value:	rsync		M Match T	Value
LIVEACTION-CLASS		rtcp rtelnet rtip rtmp rtmpe rtmpt rtp		Ma Protocol rtp	Value
	Match/match not:	Match Add Match Statement	Reflace Match Statement		

10. Select the **Policies** tab at the top left of the screen. Notice the **NBAR protocol match** on the classify tab

Manage QoS Settings - HQ-SJ.dcloud.cisc	p.com (198.18.129.25)
2 2 2 2 2 2 2	
Policies Classes Interfaces	
Policies	Mapped Classes
🛃 🖲 🗟 🛼 🐴 🖏 🤫	
E LIVEACTION-POLICY-UNIFIED	Class Name Classify Marking Queu Policing Shap Compre WRED DBL Unk
E SET_DSCP_LAN	SET_DSCP_VOICE
SET_DSCP_VOICE	class-default 🔹
	Mapped Class Detail
	Expanded and the total assessment of the second s
	Classify Marking Queueing Policing Shaping Compression WRED DBL Unsupported
	Match on: Any Reference
	Match : Protocol - using NBAR : rtp Class is defined by the
	criteria show at left.
	Match-any: packet must
	meet at least one of the criteria to be a member of
	the class.
	Match-all: packet must
	meet all criteria to be a
	Edit member of the class.
	Eat
Help	Save to Device Preview CLI Cancel

11. Select the **Marking** tab.

12. Select the Mark With check box and select the DSCP value of 46 (EF)

Manage QoS Settings - HQ-SJ.dcloud.cisc	o.com (198.18.129.25)	X
Policies Classes Interfaces		
Policies	Mapped Classes	1
📑 💐 🖹 🔝 🐜 🖏 🦈 🔫	P3 🗈 🗟 👄	
EIVEACTION-POLICY-UNIFIED		Compre WRED DBL Unk
SET_DSCP_LAN	SET_DSCP_VOICE	
class-default		
	Mapped Class Detail	
	Drop all traffic for class	
	Classify Marking Queueing Policing Shaping Compression WRED	DBL Unsupported
	Mark with:	Reference
		Differentiate packets
		belonging to this class based on marking.
	TEV4 Only	Marth On
	C ATM Cell Loss Priority	Mark On
	🦳 Frame Relay Discard Eligible	DSCP: marks a packet by setting the differentiated
		services code point (DSCP) value in the type of service
		(TOS) byte.
		Precedence: sets the
		precedence value in the
		packet header.
Help	Save to DevicePrevi	ew CLI Cancel

13. Repeat these same steps for adding more classes to the **SET_DSCP_LAN** policy for the other traffic types. Please use the following table for reference:

Class Name	DSCP	NBAR Protocol(s)
SET_DSCP_VOICE	EF (46)	rtp
SET_DSCP_VIDEO	AF41 (34)	Ms-Lync
SET_DSCP_HIGH_PRIORITY DATA	AF31 (26)	SIP, SNMP, NetFlow, SSH, Telnet, Citrix, Salesforce
SET_DSCP_SCAVENGER	CS1 (8)	Leave blank for now
Best Effort	BE (0)	n/a

When finished, the **SET_DSCP_LAN** policy should look like this:

🛕 Manage QoS Settings - HQ-SJ.dcloud.cisc	o.com (198.18.129.25)				×
2 2 2 2 2 2					
Policies Classes Interfaces					
Policies	Mapped Classes				
🔁 🖲 🗟 🛼 🐁 🗞 🔫					
E LIVEACTION-POLICY-UNIFIED	Class Name	Classify	Marking	Q Po Sh	Co W
	SET_DSCP_VOICE	٠	DSCP: EF		
SET_DSCP_VOICE	SET_DSCP_VIDEO	٠	DSCP: AF41		
SET_DSCP_VIDEO	SET_DSCP_HIGH_PRIORITY_DATA	•	DSCP: AF31		
SET_DSCP_HIGH_PRIORITY_DATA	SET_DSCP_SCAVENGER	•	DSCP: CS1		
SET_DSCP_SCAVENGER	class-default	•	DSCP: BE		
	Mapped Class Detail				
			1 -		I
	Classify Marking Queueing Polic	ing Shapin	g Compression		nsupported
	Match on: Any			Referen	ce 🔤
			_	Class is	s defined by the
				criteria	show at left.
					- any: packet must t least one of the
					to be a member of
				the clas	
					-all: packet must
					Icriteria tobe a rof the class.
		Edi	.	membe	r of the class.
			·		
1					
Help		Save	to Device	Preview CLI	Cancel

- 14. Select Save to Device.
- 15. Select **SET_DSCP_LAN** policy and select **Copy Policies to Devices** icon. This will allow you to push the policy you just created to the other routers in the network.



The Copy Policy to Devices dialog window appears.

16. Select the policy **SET_DSCP_LAN**, tick the two branch routers, and select OK.

Copy Policy to Devices 🛛 🗙
Select a policy:
SET_DSCP_LAN
Select the devices to which you want to save this policy:
Branch1-LA.dcloud.cisco.com (198.19.1.1)
Branch2-NY.dcloud.cisco.com (198.19.2.1)
,
OK Cancel

The **SET_DSCP_LAN** policy will be copied to the other routers.

Validate the changes saved successfully.

Copy Policy to Devices	×
Saving to devices	
Branch1-LA.dcloud.cisco.com (198.19.1.1) Branch2-NY.dcloud.cisco.com (198.19.2.1)	
	Cancel

17. Close the Manage QoS Dialog Window.

Lab 2.5: Apply Marking Policies to Interface(s)

Lab Steps:

QoS	Flow	Routing	IP SLA	LAN
🕂 🔶 🛛	61	□		Audit

- 1. Select the QoS Tab
- Right-click on the LAN interface on one of the routers and select QoS > Apply Policy to Interface.

Note: The LAN interface will be GigabitEthernet1 on each of the routers in this lab.



- 3. Select the **SET_DSCP_LAN** policy and tick to apply it in the **input** direction.
- 4. Click OK.

Apply Policy to Interfaces	×
Select a policy:	
SET_DSCP_LAN	\sim
Select the interfaces to which you want to apply this policy: GigabitEthernet1 GigabitEthernet2 GigabitEthernet2 Output Output Output	
OK Cancel	

Follow these same steps to apply the **SET_DSCP_LAN** policy to **the other router's LAN interface.**

Notice how when you do this for LA router, you will see **a little box** already around the input side of its LAN interface.



5. Right-click on the LA router and select **QoS > Manage QoS Settings**.

Notice how it has a policy on it called "**WhyIsThisHere**". Notice how the class-default of this policy is marking traffic as 0 (BE). No wonder we were seeing Voice (rtp) leaving this site as BE!



6. Select the Interface tab

Manage QoS Settings - Branch1-LA.dcloud.cisco.cc	rm (198.19.1.1)			×
Policies Classes Interfaces Interfaces				
<pre>GigabitEthernet1</pre>	Interface name:		ms	
Help		Save to Device	Preview CLI	Close

7. Right-click on the WhyIsThisHere policy that is highlighted on the input side of the GigabitEthernet1 interface.



- 8. Select Remove Policy from Interface
- 9. **Right-click** on the input side of the **GigabitEthernet1** interface and select **Apply Policy to Interface**.

Manage QoS Settings - Branch1-LA.dcloud.cisco.com (
Policies Classes Interfaces
Interfaces
🖃 😌 GigabitEthernet1
Input : <non< td=""></non<>
Output : <nd apply="" interface<="" policy="" td="" to=""></nd>
🖻 😌 GigabitEthernet2 🚛 Remove Policy from Interface
👍 Input : <non< td=""></non<>
Output: <none> I</none>
📄 😌 GigabitEthernet3
Input: <none></none>
Output: <none></none>
🚊 😌 GigabitEthernet4
- Liput: <none></none>
Output: <none></none>
10. Select the SET_DSCP_LAN policy and select OK.
Apply Policy to Interface
Called the called to each to the Territ of Scherifter Theorem (0/0)
Select the policy to apply to the Input of interface Ethernet0/0:
SET_DSCP_LAN
OK Cancel

11. Select **Save to Device** and close the Manage QoS Settings dialog window.

Manage QoS Settings - Branch1-LA.dcloud.cisco.	com (198.19.1.1)	×
2 ብ 🔊 🎝 🖨 🍕		
Policies Classes Interfaces		
Interfaces	_	
<pre>GigabitEthernet1 Input: SET_DSCP_LAN Output: <none> GigabitEthernet2 Input: <none> GigabitEthernet3 Input: <none> GigabitEthernet4 Input: <none> Output: <none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></pre>	Interface name: IP address: IP address mask: Interface description: Pre-classify Link Fragmentation: Maximum delay: Interleave	
Help	Save to Device Preview CLI	Close

12. Ensure all routers have the **SET_DSCP_LAN** policy applied to their **LAN** interface.

Lab 2.6: Validate DSCP Settings

We now need to validate the QoS policies we have implemented are working correctly.

1. From the LiveAction map, select the Flow Tab

Qos	Flow	Routing	IP SLA	LAN	
🕂 🔶	6/	-		Table	🔁 Refresh
Search 8	Example: ((site = Hor	nolulu sit	e = Chi	cago) & wan &

2. Update the filters to the following parameters

All Flow Types	Current Time 💌 Current Polling Interval 💌 🕻	🐺 Voice 💽	Top 50 💌 🗗	DSCP
10	_, _, _,			

Notice how, when the **Voice filter** is in place, we now see only DSCP values 46 (EF), 34 (AF41), and 26(AF31).



Remember how the ports for Voice (rtp) and Video (Lync) are in the range of 163840-32767. This means that they will both show as RTP here. This is why we are seeing 46(EF) and 34 (AF41) for RTP.

This is what we want to see – all high priority DSCP values and no 0 (BE).

- 3. Run the Reports > Flow > QOS > **DSCP** report
 - a. Select the Voice filter, but leave all parameters at their default settings
 - b. Implement a Search of "wan"
 - c. Execute Report



Notice how the DSCP value of 0 (BE) disappears from the graph around the same time as we implemented our QoS Polices.

Note: For the sake of time in this lab, we are only going to focus on this one report. Remember that in a real network, you would repeat these steps for all important applications. We would use the same visualization and reports as we have used previously to validate QoS polices effectiveness for all priority traffic.

Now that we have used LiveNX to review, implement and validate our QoS Matching and Marking polices, we can now move on to step 2 of the QoS project – Prioritization.

Lab 3

Lab 3: QoS Prioritization & Queueing

Lab 3.0: Intro to Prioritization

LiveAction



In this lab we are going to use LiveNX for creating and validating Queuing and Shaping policies in our network. There are two primary questions that need to be answered before creating any configurations. These are:

- What is the bandwidth allocations needed for each queue?
- What, if any, CIRs are enforced by the service provider?

Lab 3.1: Run the Reports!

We will tackle the bandwidth question first. The best way to answer this question is to use LiveNX's reporting to understand the priority application's capacity needs.

Since we have successfully created and validated Matching and Marking polices, we can now just reference the respective DSCP value's bandwidth usage to quantify our applications requirements.

Lab Steps:

- 1. Run the Reports > Flow > Network > Interface Bandwidth Summary report
 - a. Leave all Filter parameters at their default settings.
 - b. Implement a Search of "wan & flow.dscp=EF & flow.direction=Egress"



c. Execute Report

Notice how this shows a bandwidth graph of the data being transmitted out of each WAN interface. In this example, we are focused on Voice (rtp)/ EF traffic. This is the capacity planning data we need for Voice.

- 2. Run the Flow > Network > Interface Bandwidth Summary report
 - a. Leave all Filter parameters at their default settings
 - b. Implement a Search of "wan & flow.dscp=AF41 & flow.direction=Egress"



Notice how this shows a bandwidth graph of the data being transmitted out of each WAN interface. In this example, we are focused on Video (ms-Lync)/AF41 traffic. This is the capacity planning data we need for Video.

- 3. Run the Flow > Network > Interface Bandwidth Summary Report
 - a. Leave all Filter parameters at their default settings
 - b. Implement a Search of "wan & flow.dscp=AF31 & flow.direction=Egress"

Q+ Type here to filter reports.	Interface Bandwidth Summary				
Reports Top Analysis Top Analysis Ps and Ports Address Address Adjustions QoS Network	Interface Bandwidth Summary 15m 1h Execute Report Source All Devices St. non-filtered flows: 616	6h 1d 1w 30d Custom			
Interface Bandwidth Sur Bandwidth Summary	Filter *DefaultFilterGroup 🗸 🖷 Graph Basic Flow 🗸 Time Series 🗸	Bit Rate 🗸			
Traffic Volume Pair Outbound Bandwidth Util Bidirectional Network Pa	Search van & flow.dscp=AF31 & flow.direction=Egress	X - ?			
-Source or Destination Ne -Network Pair	HQ-SJ.dcloud.cisco.com - Ethernet0/1				
- Source Network - Destination Network - Bidirectional AS Pair - Source or Destination At - Source AS - Destination AS - Medianet - Medianet - NSEL - PPR - Wireless - Wireless	20 Kbps				
● AnyConnect ● Miscellaneous - Custom Reports	Oet 24, 12:20 AM Oet 24, 12:30 AM Oet 24, 12:40 AM Oet 24, 12:50 AM Oet 24, 01:00 AM Oet 24, 01:10 A Date	M Oct 24, 01:20 AM			
	Number of datasets: 1	2,×			
	Device Interface Name Direction Total Flows Total Bytes Total Packets Average Bit Rate Average Packet R Peak B	bit Rate Peak Packet Rate 21.6 Kbps 23 pps			
Report Actions Save Save As Create					
idit	Branch1-LA.dcloud.eisco.com - Ethernet0/2				
chedule	11 Kbps				
DF	10 Kbps				
xport to CSV	9 Kbps 2 8 kbps 2 7 Kbps				
ielp	й 7 Кbps Т 6 Кbps				
	5 Kbps				

Notice how this shows a bandwidth graph of the data being transmitted out each WAN interface. In this example, we are focused on High Priority Data/ AF31 traffic. This is the capacity planning data we need for the High Priority Data.

Note: In a real network, it would be best to have at least two weeks of data to formulate the appropriate bandwidth allocations for the priority applications. Also remember that since Priority/LLQ queues have a built-in policer, one would want to over provision the settings based on these queues.

Lab 3.2: Building Queueing Policies

1. From the LiveAction map, select the QoS Tab



2. Right-click the HQ router, select QoS > Manage QoS Settings



The Manage QoS Dialog Window will open

Manage QoS Settings - HQ-SJ.dcloud.cise	:o.com (198.18.129.25)	×
Policies Classes Interfaces		
Policies	Mapped Classes	1
📑 🔁 💥 🔝 騙 🕼 🖏 👒		
E		npression WRED DBL Unknown
H-10 SET DSCP LAN	class-default 🔹	
	Mapped Class Detail	
	Drop all traffic for class	n Inge I generated I
	Classify Marking Queueing Policing Shaping Compression WRB	· · · · ·
	Match on: Any	Reference
		Class is defined by the criteria show at left.
		Match-any: packet must
		meet at least one of the
		criteria to be a member of the class.
		Match-all: packet must
		meet all criteria to be a
	Edit	member of the class.
Help	Save to Device Pro	eview CLI Cancel

3. Add a new Policy and name it QUEUEING.

Add Policy			
Policy name: QUEUEING			
	ок	Cancel	

4. Create a **new class** for the QUEUEING policy and name it **VOICE**.

🗚 Add Class to Policy 🛛 🗙
Select one of the following options:
O Use existing class: LIVEACTION-CLASS-AVC
Create new class: VOICE
Note: This option will create an empty class. You will need to select the "Class tab" to add classification parameters.
OK Cancel

You should see the VOICE class inside the policy named QUEUEING

Policies Polici	Mapped Classes Image: Class Name Classify Marking Queueing Policing Shaping Comp VOICE Image: Class-default Image: Class-default
	Mapped Class Detail Drop all traffic for class Classify Marking Queueing Policing Shaping Compression WREE Match on: Any

5. Update the Classes tab of the VOICE class to match **DSCP 46 (EF)** traffic

🕼 Manage Qo5 Settings - HQ-5J.dcloud.cisco.com (198.18.129.25) 🛛 🔀							
Policies Classes Inte	Policies Classes Interfaces						
Classes	Create and Edit Mat	ch Statements					
🕒 🖻 😹	Match type:	DSCP		-	Match any 💌 😻		
LIVEACTION-CLASS	Value:	40 (CS5)			4 Match T	Value	
SET_DSCP_HIGH_P		41			la DSCP 46 (EF)		
SET_DSCP_SCAVEN		42					
SET_DSCP_VIDEO		43					
SET_DSCP_VOICE		44					
VOICE		45 46 (EF)					
		47		-			
		(Select up to 8 values)					
	Match/match not:	Match		-			
		IPv4 Only					
		Add Match Statement	Replace Match Statement				
	_			_			
Help			Save to D)evice	Preview CLI	Cancel	

- 6. Return to the Policies tab
- 7. Ensure the **VOICE class** of **QUEUEING** policy is highlighted and select the **Queueing** tab.
- 8. Set the Queueing type to Priority and the bandwidth to 160 Kbps.

🔼 Manage QoS Settings - HQ-SJ.dcloud.cisc	:o.com (198.18.129.25) 🛛 🗙			
Policies Classes Interfaces				
Policies	Mapped Classes			
E - LIVEACTION-POLICY-UNIFIED	Class Name Classify Marking Queueing Policing Shaping Compres WRED DBL Unkn			
	VOICE 🔷 Priority: 160 Kbps			
	class-default 🛛 👳			
L class-default ⊡				
	Mapped Class Detail			
	Drop all traffic for class			
	Classify Marking Queueing Policing Shaping Compression WRED DBL Unsupported			
	Queueing type: Priority Reference			
	Distribute the available			
	Rate: 160 Kbps - bandwidth between			
	Burst size: 32 bytes classes by specifying a			
	- , Intrinditional Sandwidth			
	Unknown elements: guarantee to each class.			
	Queueing Type			
	Class-based: utilizes			
	Class-based weighted fair			
	queueing (CBV/FQ) using			
	derived weight for packets			
	from the bandwidth allocated to the class.			
Help	Save to Device Preview CLI Cancel			

LiveAction Lab Workbook Pt. 2

9. Create the following classes in the QUEUEING policy based on the following table:

Class Name	Match DSCP	Queueing
VOICE	EF (46)	Priority – 160K
VIDEO	AF41 (34)	Priority – 800K
HIGH_PRIORITY DATA	AF31 (26)	Class Based – 64K
SCAVENGER	CS1 (8)	Class Based – 8K
Best Effort	BE (0)	n/a

When finished, the **QUEUEING** policy should look similar to this:

Manage QoS Settings - HQ-SJ.dcloud.cisc	o.com (198.18.129.25)	×
2 2 2 2 2 2 2		
Policies Classes Interfaces		
Policies	Mapped Classes	
UVEACTION-POLICY-UNIFIED	Class Name Classify Marking Queueing Pol Sh Com W DBL U	7
	VOICE Priority: 160 Kbps	4
VOICE	VIDEO Priority: 800 Kbps	1
VIDEO	HIGH_PRIORITY_DATA Class-based: 64 Kbps	1
HIGH_PRIORITY_DATA	SCAVENGER 🔷 Class-based: 8 Kbps	11
class-default	class-default 👳	
	Mapped Class Detail Drop all traffic for class	
	Classify Marking Queueing Policing Shaping Compression WRED DBL Unsupported	
	Queueing type: Class-based Reference Rate: 8 kbps Image: Second sec	
	Unknown elements: Queueing Type Class-based: utilizes Class-based:	
Help	Save to Device Preview CLI Cancel	

10. Click Save to Device.

11. Click and highlight the QUEUEING policy and select the **Copy Policies to Devices** icon.

This will allow you to push the policy you just created to the other routers in the network.



12. Push the QUEUEING policy to the other routers

Copy Policy to Devices	×
Saving to devices	
Branch1-LA.dcloud.cisco.com (198.19.1.1) Branch2-NY.dcloud.cisco.com (198.19.2.1)	-
	Cancel

Note: We are not applying these policies to interfaces at this step.

Lab 4

Lab 4: Shaping / Scaling

Lab 4.0: Intro - Shaping (Scaling)

Remember, we had stated previously that one of the key questions that needs to be answered before implementing QoS Prioritization is to understand any CIR that may be enforced by the service provider.

Below is a diagram of the lab network. The MPLS network in our lab does have CIRs in place with the following deign:

- HQ no provider CIR
- NY 1.5Mb provider CIR
- LA 1.5MB provider CIR

For the sake of this lab assume there is no other QoS on the service provider's backbone.



To accommodate this design we will need to build the following shaping policies:

- HQ Multi-class hierarchical shaping policy*
- NY basic hierarchical shaping policy
- LA basic hierarchical shaping policy

*Note - that if the service provider did have additional QoS on their backbone, then the multiclass hierarchical policy would not be a requirement.

Lab 4.1: Shaping (Scaling)

Lab Steps:

1. From the LiveAction map, select the QoS Tab



2. Right-click on the HQ router, select QoS > Manage QoS Settings



The Manage QoS Dialog Window will open

3. Create a new policy and name it MULTI_CLASS_SHAPING

🛕 Add Policy		×
Policy name: ML	JLTI_CLASS_SH	APING
	ок	Cancel

- 4. Create two classes within this Policy:
 - HQ_TO_NY
 - HQ_TO_LA

Manage QoS Settings - HQ-SJ.dcloud.cisc	o.com (198.18.129.25) 🛛 🔀
2 2 2 2 2 2 2	
Policies Classes Interfaces	
Policies	Mapped Classes
🛂 🖲 😹 🚠 🐁 🖏 🤤	
E LIVEACTION-POLICY-UNIFIED	Class Name Classify Marking Queueing Policing Shaping Compression WRED DBL Unknown
MULTI_CLASS_SHAPING	HQ_TO_LA 🔶
HQ_TO_NY class-default	class-default 🔹
🗄 😼 SET_DSCP_LAN	
	Mapped Class Detail
	Top all traffic for class
	Classify Marking Queueing Policing Shaping Compression WRED DBL Unsupported
	Match on: Any Reference
	Class is defined by the
	criteria show at left.
	Match-any: packet must
	meet at least one of the
	criteria to be a member of
	the class.
	Match-all: packet must
	meet all criteria to be a
	Edit
Help	Save to Device Preview CLI Cancel

Note: These classes each reference an access-list (ACL) for matching traffic from HQ to the respective remote sites. **These ACLs may NOT have been created... you may need to create 2 ACLs before continuing with the Lab.**

5. Edit these classes, but chose the match type of "ACL Name"

🛕 Manage QoS Sett	ings - HQ-SJ.dcloud.	cisco.com (198.18.129.25)
4 1	a 🕹	
Policies Classes Inte	erfaces	
Classes	Create and Edit Mat	ch Statements
	Match type: Value:	Any
HQ_TO_LA HQ_TO_NY LIVEACTION-CLASS SCAVENGER SET_DSCP_HIGH_P SET_DSCP_SCAVEN SET_DSCP_VIDEO SET_DSCP_VOICE VIDEO VOICE		ACL Name ACL Number Class COS DSCP Frame relay DE bit Frame relay DLCI RTP Protocol - using NBAR HTTP Protocol - using NBAR Input interface IP Precedence MAC Destination Address MAC Source Address MAC Source Address MPLS experimental topmost Packet length Protocol - using NBAR Protocol - using NBAR Protocol - using NBAR groups QoS group

Note: You may need to create the following ACLs on your Training Pod. Use the steps you learned in Lab Workbook Pt.1, to create the new ACLs. Create "HQ_TO_NY" from IP 198.18.129.0/24 to 198.19.2.0/24, and "HQ_TO_LA" from IP 198.19.129.0/24 to 198.19.1.0/24

- 6. Match the HQ_TO_NY class to the HQ_TO_NY_ACL
- 7. **Match** the HQ_TO_LA class to the HQ_TO_LA_ACL

Policies Classes Interfaces Classes Create and Edit Match Statements Classes Create and Edit Match Statements Match type: ACL Name Match ary Willie High-PRIORITY HUEACTION-CLASS SCAVENGER SET_DSCP_SLAVEN SET_DSCP_VIDEO SET_DSCP_VIDEO SET_DSCP_VIDEO Match/match not: Match VOICE Match/match not: Match VOICE Add Match Statement Replace Match Statement	A Manage QoS Settin	gs - HQ-SJ.dcloud.	cisco.com (198.18.129.25)			×
Create and Edit Match Statements Create and Edit Match Statements HIGH_PRIORITY_D HQ_TO_LA UVEACTION-CLASS LIVEACTION-CLASS LIVEACTION-CLASS SCAVENGER SET_DSCP_VALUE Match/match not: Match VIDEO VOICE Match/match not: Match Replace Match Statement Replace Match Statement	a a a a a	l 🙆 🖏				
Match type: ACL Name HIGH_PRIORITY_D, Value: HQ_TO_LA Value: HQ_TO_LA Value: HQTO_NV LIVEACTION-CLASS LIVEACTION-CLASS LIVEACTION-ACL SET_DSCP_VIDEO Watch indt: SET_DSCP_VIDEO Watch indt: Match/match not: Match VOICE Add Match Statement	Policies Classes Interf	faces				
HIGH_PRIORITY_D, HQ_TO_LA HQ_TO_LA HQ_TO_LA UVEACTION-CLASS SCAVENGER SET_DSCP_VICA SET_DSCP_VICAC SET_DSCP_VICAC SET_DSCP_VICAC SET_DSCP_VICAC Match/match not: Match VIDEO VOICE Match/match not: Match Statement Replace Match Statement	Classes	Create and Edit Mat	ch Statements			
HQ_TO_IA HQ_TO_IN HVEACTION-CLASS SCAVENGER SET_DSCP_HIGH_P SET_DSCP_SCAVEN SET_DSCP_VIDEO SET_DSCP_VIDEO SET_DSCP_VIDEO SET_DSCP_VIDEO Match/match not: Match VDEO VOICE Match/match statement Replace Match Statement		Match type:	ACL Name	•	Match any 💌 💐	
HQ_TO_IN LIVEACTION-CLASS SCAVENGER SET_DSCP_HIGH_P SET_DSCP_HIGH_P SET_DSCP_VIDEO SET_DSCP_VIDEO SET_DSCP_VIDEO Match/match not: Match VDICE Match/match not: Match Replace Match Statement		Value:	HQ_TO_LA_ACL	×	M Match T	Value
LIVEACTION-CLASS SCAVENAGER SET_DSCP_VIDEO SET_DSCP_VOLEO VOICE VOICE Match/match not: Match Match/match not: Match VOICE			HQ_TO_NY_ACL			
LIVEACTION-CLASS SCAVENSER SET_DSCP_ICIGH_P SET_DSCP_VOICE SET_DSCP_VOICE VIDEO VOICE Match/match not: Match Statement Replace Match Statement			LIVEACTION-ACL-AVC			
SET_DSCP_HIGH_P SET_DSCP_SCAVEN SET_DSCP_VIDEO VIDEO VOICE Add Match Statement Replace Match Statement						
SET_DSCP_SCAVEN SET_DSCP_VOICE VIDEO VOICE Match/match not: Match Add Match Statement Replace Match Statement	SCAVENGER					
SET_DSCP_VDICE VDICE Watch/match.not: Match VDICE Add Match Statement Replace Match Statement						
SET_DSCP_VOICE Match/match not: Match VIDEO Add Match Statement Replace Match Statement VOICE Add Match Statement Replace Match Statement				-		
VIDEO Add Match Statement Replace Match Statement						
VOICE Add Match Statement Replace Match Statement		Match/match not:	Match	×		
			Add Match Statement	Replace Match Statement		
		_				
Help Save to Device Preview CLI Cancel	Help			Save to Devic	e Preview CLI	Cancel

8. When finished, return to the **Policy** tab

🛕 Manage QoS Settings - HQ-SJ.dcloud.cisc	o.com (198.18.129.25)	×
2 2 2 2 2 2 2		
Policies Classes Interfaces		
Policies	Mapped Classes	
🔁 🖲 📚 🔝 🐜 🐁 🕸		
E	Class Name Classify Marking Queueing Policing Shaping Compres	ssion WRED DBL Unknown
	HQ_TO_LA •	
HQ_TO_LA	HQ_TO_NY 🔷	
	class-default 🔹	
E SET_DSCP_LAN		
	Mapped Class Detail	
	🔽 Drop all traffic for class	
	Classify Marking Queueing Policing Shaping Compression WRED 1	DBL Unsupported
		Reference
	Match : ACL Name : HQ_TO_NY_ACL	Class is defined by the criteria show at left.
		chicha show ai leit.
		Match-any: packet must
		meet at least one of the
		criteria to be a member of
		the class.
		Match-all: packet must
		meet all criteria to be a
	5-4h	member of the class.
	Edit	
· · · · · · · · · · · · · · · · · · ·		
Help	Save to Device Preview	v CLI Cancel

- 9. Select the **HQ_TO_NY** class and select the **shaping** tab. Set its parameters to:
 - Shape using = Average
 - Rate = 1544 Kbps
 - Committed burst = 15,440
 - Excess burst = 0
- 10. Select the **HQ_TO_LA** class and select the **shaping** tab. Set its parameters to:
 - Shape using = Average
 - Rate = 1544 Kbps
 - Committed burst = 15,440
 - Excess burst = 0

LiveAction Lab Workbook Pt. 2

🛕 Manage QoS Settings - HQ-SJ.dcloud.cisc	o.com (198.18.129.25)			×
2 2 2 2 2 2				
Policies Classes Interfaces				
Policies	Mapped Classes			
E LIVEACTION-POLICY-UNIFIED	Class Name Classify Marking Que		1 2	VRED DBL Unkno
	HQ_TO_LA 🔷	1,544		
HQ_TO_LA HQ_TO_NY class-default QUEUEING ESET_DSCP_LAN	HQ_TO_NY	1,544	ł Kbps	
	Mapped Class Detail			
	Drop all traffic for class			
	Classify Marking Queueing Policing	Shaping Compressi	ion WRED DBL Unsu	upported
	Shape using: Average 💌		Reference	
		-	Control th	e flow of 🔺
	Rate: 1,544 Kbps	r I		d eliminate
	Committed burst: 15,440	bits		ks by delaying
				and conforming ified bit rate.
	Excess burst:	bits		
	Unknown elements:		Rate	
			Peak: allo	ows the
				ion rate to
			-	her than the
			shaping r	ate.
			Average	: sets the
			maximum	transmission 📃
Help		Save to Device	Preview CLI	Cancel

- 11. Click-Drag-and-Drop the QUEUEING policy to the class-default of the HQ_TO_NY policy
- 12. Click-Drag-and-Drop the QUEUEING policy to the class-default of the HQ_TO_LA policy

When finished your view should look like this:

Manage QoS Settings - HQ-SJ.dcloud.cisc	o.com (198.18.129.25) 🛛 🗙
Policies Classes Interfaces	
Policies	Mapped Classes
E liveaction-policy-unified	Class Name Classify Marking Queueing Policing Shaping Compression WRED DBL Unknown
E MULTI_CLASS_SHAPING	VOICE Priority:
	VIDEO • Priority:
	HIGH_PRIORITY_D Class-b
⊨ HQ_TO_NY	SCAVENGER 👳 Class-b
QUEUEING	class-default 👳
VICE	
HIGH_PRIORITY_DATA	Mapped Class Detail
SCAVENGER	Drop all traffic for class
class-default	Classify Marking Queueing Policing Shaping Compression WRED DBL Unsupported
E SET_DSCP_LAN	
	Shape using: None 👻
	Control the flow of
	traffic and eliminate
	bottlenecks by delaying
	packets and conforming

13. Select the interfaces tab and **apply** the MULTI_CLASS_SHAPING policy to the **output** of the GigabitEthernet2 interface.

Policies Classes Interfaces Interfaces Interfaces Interfaces Interfaces Interfaces Input: SET_DSCP_LAN Output: SET_DSCP_LAN Output: SET_DSCP_LAN Output: <none> Output: <none> Output: MULTI_CLASS_SHAPING GigabitEthernet3 Input: <none> Output: <none> Output</none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none>	Interface name: IP address: IP address mask: Interface description: Pre-classify Link Fragmentation: Maximum delay:		ms	
Help		Save to Device	Preview CLI	Close

14. Click Save to Device.

Next, we will build basic hierarchical polices on the remote routers.

- 1. In LiveNX, select the QoS Tab
- 2. Right-click on the one of the remote routers, select QoS > Manage QoS Settings
- 3. Create a new policy and name it "SHAPING 1.544Mb"

🗚 Add Policy		
Policy name: SH	IAPING_1.544M	0
	ок	Cancel

- 4. Select its **class-default** and select the **Shaping** tab.
- 5. Implement a shaping policy with the following parameters:
 - Shape using = Average
 - Rate = 1544 Kbps
 - Committed burst = 15,440
 - Excess burst = 0

Manage Qo5 Settings - Branch2-NY.dclou	ıd.cisco.com (198.19.2.1)	×
2 2 2 2 2 2 2		
Policies Classes Interfaces		
Policies	Mapped Classes	
LIVEACTION-POLICY-UNIFIED QUEUEING		WRED DBL Unknown
E SET_DSCP_LAN	class-default 🔹 1,544 Kbps	
SHAPING_1.544Mb		
Lass-default		
	Mapped Class Detail	
	Drop all traffic for class	
	Classify Marking Queueing Policing Shaping Compression WRED DBL Un	isupported 1
	Shape using: Average 💌 Reference	
		the flow of
		and eliminate ecks by delaying
		s and conforming
	Excess burst: 0 bits to a spe	ecified bit rate.
	Unknown elements: Rate	
	Peak: a	allows the
		ssion rate to
	shaping	igher than the grate.
		ge:setsthe m transmission
Help	Save to Device Preview CLI	Cancel

6. **Click-Drag-and-Drop** the QUEUEING policy onto the **class-default** of the SHAPING_1.544Mb policy.



7. Copy the SHAPING_1.544Mb policy to the other remote router



You will be warned there is a conflict. This is because a policy named QUEUEING already exist on the other remote router.

8. Select Overwrite.

Copy Policy to Devices	×
Conflicts were encountered when saving the policy on device Branch1-LA.dcloud.cisco.com (198.19.1.1). The policy is shown below, with conflicting settings highlighted in red. Do you want to continue?	
SHAPING_1.544Mb class-default Shaping: 1,544,000 bps QUEUEING - Overwritten (A policy with the same name exists) VOICE VOICE Match DSCP "46 (EF)" Queueing: Priority 160 Kbps Match DSCP "46 (EF)" Queueing: Priority 800 Kbps Match DSCP "34 (AF41)" HIGH_PRIORITY_DATA Queueing: Class-based 64 Kbps	
View all conflicts	_
Overwrite Skip Cancel	

9. Validate the changes saved successfully.



10. Save to Device and close the Manage QoS Settings dialog window.

- 11. Select the QoS Tab
- 12. Right-click on the WAN interface (GigEth1) on the NY router, select QoS > Apply Policy to Interface



13. **Apply** the SHAPING_1.544Mb policy to the output of GigabitEthernet3.

Apply Policy to Interfaces ×
Select a policy: SHAPING_1.544Mb
Select the interfaces to which you want to apply this policy:
OK Cancel

14. Repeat this process and apply the SHAPING_1.544Mb policy to the **other remote router**.

Lab 5

Lab 5: Throttling Traffic
Lab 5.0: Intro - Throttling / Policing

LiveAction

Step 3 - Throttle Traffic (Policing and WRED)



· WRED - Selectively drop specific data before congestion occurs

Investigate the current traffic flows.

1. From the LiveNX Client, select the QoS Tab



2. Select GigabitEthernet1 from the HQ-B2 router



3. Update the real-time interface view to the following settings.



Notice the applications listed in the NBAR view at the top right of the page:



Why do we see bittorrent, bittorrent-networking, and Pandora on our business network?



4. Run a Flow > Application report to see the same type of data.

Lab 5.1: Throttling / Policing

We'll implement a basic policing polity to throttle any scavenger (less than default) traffic.

Lab Steps:

1. From the LiveAction map, select the QoS Tab



2. Right-click on the HQ-B2 router and select QoS > Manage QoS Settings



Remember how we created a SET_DSCP_SCAVENGER class as part of the SET_DSCP_LAN policy? But also remember how we did not assign any classification to this class?

Class Name	DSCP	NBAR Protocol(s)
SET_DSCP_VOICE	EF (46)	rtp
SET_DSCP_VIDEO	AF41 (34)	Lync
SET_DSCP_HIGH_PRIORITY	AF31	SIP, SNMP, NetFlow, SSH, Telnet, Citrix,
DATA		Salesiorce
SET_DSCP_SCAVENGER	CS1 (8)	Leave blank for now
Best Effort	DE (0)	n/a

Manage QoS Settings - HQ-SJ.dcloud.cisc	o.com (198.18.129.25)				×
2 2 2 2 2 2 2					
Policies Classes Interfaces					
Policies	Mapped Classes				
📑 🖲 🗟 🛼 🖏 🖏					
E LIVEACTION-POLICY-UNIFIED	Class Name	Classify	Marking	Q Po Sh	Co W
E SET_DSCP_LAN	SET_DSCP_VOICE	٠	DSCP: EF		
SET_DSCP_VOICE	SET_DSCP_VIDEO	٠	DSCP: AF41		
SET_DSCP_VIDEO	SET_DSCR_UTCL_PRIORITY_DATA		DCCD: AE31		
SET_DSCP_HIGH_PRIORITY_DAT		٠	DSCP: CS1		
SET_DSCP_SCAVENGER	Class-doreal	^			
class-default					
	1				
	Mapped Class Detail				
	Drop all traffic for class				
		1	1	1	
	Classify Marking Queueing Policin	ig Shaping] Compression	n WRED DBL Unsi	upported
	Match on: Any			Reference	.
			_	Class is o	defined by the
					how at left.
					ny: packet must
					be a member of
				the class	
				Match-a	II: packet must
				meet all c	riteria to be a
	· ·			member of	of the class.
		Edit			
l				,	
Help		Save	to Device	Preview CLI	Cancel

- 3. Update the SET_DSCP_SCAVENGER class with the following traffic:
 Pandora

 - Bittorrent •
 - Bittorrent-networking •

Manage QoS Settings - HQ-SJ.dcloud.cisco.com (198.	8.129.25)
4 4 4 4 4	
Policies Classes Interfaces	
Classes Create and Edit Match Statements	
Classes Create and Edit Match Statements Image: Comparison of the system of	ce M Match T Value Ma Protocol bittorrent Ma Protocol pandora Ma Protocol pandora

When finished, the SET_DSCP_LAN policy should look like this:

Manage QoS Settings - HQ-SJ.dcloud.cisc	o.com (198.18.129.25)	×
2 2 2 2 2 2 2		
Policies Classes Interfaces		
Policies	Mapped Classes	1
📑 🖲 😹 🐜 🐴 🖏 🖶		
E LIVEACTION-POLICY-UNIFIED	Class Name Clas Marking Que Poli Sha	Compr W DBL Unk
E MULTI_CLASS_SHAPING	SET_DSCP_VOICE	
	SET_DSCP_VIDEO 💿 DSCP: AF41	
E SET_DSCP_LAN	SET_DSCP_HIGH_PRIORI 👳 DSCP: AF31	
SET_DSCP_VOICE	SET_DSCP_SCAVENGER 🔷 DSCP: CS1	
SET_DSCP_VIDEO	class-default 💿 DSCP: BE	
SET_DSCP_HIGH_PRIORITY_DATA		
Class-derault	, Mapped Class Detail	
	Drop all traffic for class	
	Classify Marking Queueing Policing Shaping Compression WRED	DBL Unsupported
	Match on: Any	Reference
	Match : Protocol - using NBAR : bittorrent	Class is defined by the
	Match : Protocol - using NBAR : bittorrent-networki	criteria show at left.
	Match : Protocol - using NBAR : pandora	Match-any: packet must meet at least one of the criteria to be a member of the class.
	Edit	Match-all: packet must meet all criteria to be a member of the class.

- 4. Select the **Policing** tab and **update** the following settings:
 - Policing Enabled
 - Committed Information Rate = 8Kbps
 - Conform Action = Transmit
 - Exceed Action = Drop

Manage QoS Settings - HQ-SJ.dcloud.cise	:o.com (198.18.129.25)	×
5 4 9 8 8 8 8		
Policies Classes Interfaces		
Policies	Mapped Classes	
E LIVEACTION-POLICY-UNIFIED	Class Name Clas Marking Que Poli Sha	Compr W DBL Unk
E MULTI_CLASS_SHAPING	SET_DSCP_VOICE	
	SET_DSCP_VIDEO 🛛 💿 DSCP: AF41	
E SET_DSCP_LAN	SET_DSCP_HIGH_PRIORI 👳 DSCP: AF31	
SET_DSCP_VOICE	SET_DSCP_SCAVENGER	
SET_DSCP_VIDEO	class-default 🛛 💿 DSCP: BE	
SET_DSCP_HIGH_PRIORITY_DATA		
SET_DSCP_SCAVENGER		
class-derauld		
	Mapped Class Detail	
	🔲 Drop all traffic for class	
	Classify Marking Queueing Policing Shaping Compression WRED I	DBL Unsupported
	✓ Enable policing	Reference
	Committed Information Rate: 8 kbps	Limits the bandwidth
	Peak Information Rate:	traffic by specifying bandwidth thresholds
	Committed burst: 1,000 bytes	and the response
	Excess burst: 1,000 bytes	when thresholds have
	Conform action: Transmit	Rate
	Exceed action: Drop	bps: average rate in
	Violate action: (Default)	bits per second.
		nercent: average rate

5. Select Save to Device.

6. Copy the SET_DSCP_LAN policy to the other available routers.

\Lambda Manage QoS Settings - HQ-SJ.dcloud.o	isco.com (198.18.129.25)	×
2 3 3 3 8 8		
Policies Classes Interfaces		
Policies	Mapped Classes	1
🔁 🛈 🕱 🔝 🔚 🕼 Sy 🛛		
LIVEACTION-POLICY-UNIFIED MULTI_CLASS_SHAPING		Compr W DBL Unk
	SET_DSCP_VOICE DSCP: EF SET_DSCP_VIDEO DSCP: AF41	
	SET_DSCP_VIDEO DSCP: AF41	
	Copy Policy to Devices	
SET_DSCP_VIDEO	Select a policy:	
SET_DSCP_HIGH_PRIORITY_DAT	SET_DSCP_LAN	
dass-default		
	Select the devices to which you want to save this policy:	
	Branch1-LA.dcloud.cisco.com (198.19.1.1)	
		L Unsupported
	II WRED DE	1
		Reference
		Limits the bandwidth
		utilized by a class of traffic by specifying
		bandwidth thresholds
	OK Cancel	and the response
	OK Cancel	when thresholds have
-		been exceeded.
		Rate
		bps: average rate in
		bits per second.
		percent: average rate
		as percent of total
Help	Save to Device Preview 0	CLI Cancel

Note: You will get a conflict waning... simply select Overwrite.



7. Validate the changes saved successfully., Click **Close**,



8. Close the Manage QoS Settings Dialog Window

Lab 5.2: Confirm policing Settings

Lab Steps:

1. Select the QoS Tab.



- 2. From the device list, select the HQ-B2 router's LAN interface GigabitEthernet1
- 3. Update the real-time view's options to just include the input.



Note: Notice how the SET_DSCP_SCAVENGER class is amber? The amber confirms that drops are occurring inside the queue.



Lab 6

Lab 6: Buffer tuning

Lab 6.0: Intro – Buffer Tuning

Buffer Tuning

LiveAction



Buffer tuning is an advanced QoS topic that LiveNX can greatly assist with simplifying the implementation and validation. It should be noted that buffer tuning should usually only be implemented for important, bursty traffic classes like video, desktop replacement applications (VDI), or transactional data.

This lab is based on an issue that happens about every 20-30 minutes. You may have to wait to see this issue, or review historic data to find the issue. This is a very good re-world scenario.

- 1. The first place to look for the issue is to review the in-application alerts.
 - a. At the bottom left of the LiveNX window, note the Red Alert



- b. Double click the alert button
- c. The In-Application Alert view appears

015/10/24 01:47:33 AM Warning HQ-53 QoS Class droped rate CLEARED: Interface direction - OUTPUT; Policy name - MULTI_CLASS_SHAPING; Lass name. 016/10/24 02:06:32 AM Warning Branch:1-A Device Config Cha Device configuration c Usename - admir; Commands - show privlege; terminal length 0; terminal width 0; enable; ***; config t; class-man. 016/10/24 02:06:37 AM Warning Branch:1-A Device Config Cha Device configuration c Usename - admir; Commands - show privlege; terminal length 0; terminal width 0; enable; ***; config t; class-man. 016/10/24 02:06:57 AM Warning HQ-53 Device configuration c Device configuration c Usename - admir; Commands - show privlege; terminal length 0; terminal width 0; enable; ***; config t; class-man. 016/10/24 02:06:57 AM Warning HQ-53 Device configuration c Device configuration c Usename - admir; Commands - show privlege; terminal length 0; terminal width 0; enable; ***; config t; class-man. 016/10/24 02:00:37 AM Warning HQ-53 QoS Class dropped rate Interface amere Ethernet0/1; Interface direction - OUTPUT; Policy name - MULTI_CLASS_SHAPING; 016/10/24 02:00:33 AM Warning HQ-53 QoS Class dropped rate Interface amere Ethernet0/1; Interface direction - OUTPUT; Policy name - MULTI_CLASS_SHAPING; <t< th=""><th>Time</th><th>Severity</th><th>Device</th><th>Group</th><th>Alert Type</th><th>Details</th></t<>	Time	Severity	Device	Group	Alert Type	Details
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Beep when a new alert is received	Bring this window to the l	ront when a ne	u alart ic racaiva	d		
			A dicircita receive			
	Beep when a new alert is	received				
						Clear list Export list Historical search Configure ale

- d. Are there any alerts class drop alerts from the VIDEO class?
- e. If not, we will want to wait or do a Historic Search for class-dropped rate (see Appendix A.)
- f. If there are any alerts for VIDEO, note the device and interface where the drop occurred. In this example, the device is HQ-SJ and the interface is GigabitEthernet1.
- g. Select this interface from the device list.

File View Users QoS Flow F
Dashboard Manage 🗈 Expand
Q
Name
🖃 🔕 Home
🖶 🛞 Branch1-LA
🗄 🋞 Branch2-NY
🕀 🛞 HQ-B1
🖻 🛞 HQ-B2
GigabitEthernet1
GigabitEthernet2
🖻 🛞 HQ-MC
🔤 😌 GigabitEthernet1

h. From the real-time interface view, if necessary, update the view to:



i. The bottom section of the window is a **QoS drops** report. Note if there have been any QoS drops in the VIDEO class.

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- j. There have been minimal drops in the Video Class.
- k. Click and drag your mouse on the bottom graph to make an outline of a box. When you let go the map should zoom in.



I. The zoomed-in graph shows the minimal drops happening in the VIDEO (purple) class and the class-default (grey). In this example there have been 9 drops at peak in the VIDEO class.



- m. To investigate the same type of drops from a historical report select the icon.
- n. The Pre-Policy and Post-Policy Drops report will open.
- Click and drag your mouse on the bottom graph to make an outline of a box. When you let go the map should zoom in. Note that there are minimal VIDEO (purple) drops in this example too.



- p. Remember we configured the VIDEO queue for each site to 800Kbps each.
- q. The Pre-Policy graph above shows 776 Kbps peak VIDEO traffic on the HQ_TO_LA child policy and 389 Kbps to the HQ_TO_NY child policy.
- r. Neither of these are above the provisioned 800K. We need to implement some buffer tuning.

Lab 6.1: Implementing Tuning

Lab Steps:

1.	Select the	QoS Tab
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QoS	Flow	Routing	IP SLA	LAN	
🕂 🔶 🖟	6/	□ , • €		Audit	

2. Right-click the HQ-B2 router and select QoS > Manage QoS Settings



- 3. Expand the QUEUEING Policy
- 4. **Select** the VIDEO class.
- 5. Select the Queueing tab
- 6. Tick the **Burst option** and set it to **128000**.

Manage QoS Settings - HQ-SJ.dcloud.cisc	:o.com (198.18.129.25) 🛛 🗙
2 2 2 2 2 2 2	
Policies Classes Interfaces	
Policies	Mapped Classes
Image: Section Policy - Unified Image: Section Policy - Unified <t< th=""><th>Image: Class Name Classify Marking Queueing Poli Sha Compr W DBL Un VOICE • Priority: 160 Kbps VIDEO • Priority: 800 Kbps</th></t<>	Image: Class Name Classify Marking Queueing Poli Sha Compr W DBL Un VOICE • Priority: 160 Kbps VIDEO • Priority: 800 Kbps
VOICE	HIGH_PRIORITY Class-based; 64 Kbps
VIDEO HIGH_PRIORITY_DATA SCAVENGER class-default DSCP_LAN	SCAVENGER Class-based: 8 Kbps class-default
	Mapped Class Detail
	🗖 Drop all traffic for class
	Classify Marking Queueing Policing Shaping Compression WRED DBL Unsupported
	Queueing type: Priority Reference Distribute the available bandwidth between classes by specifying a minimum bandwidth guarantee to each class. Reference Distribute the available bandwidth between classes by specifying a minimum bandwidth guarantee to each class. Priority Reference Distribute the available bandwidth between classes by specifying a minimum bandwidth guarantee to each class.
	Queueing Type Class-based: utilizes Class-based weighted fair queueing (CBWFQ) using derived weight for packets from the bandwidth allocated to the class.
Help	Save to Device Preview CLI Cancel

To understand this value, please see the **TelePresence Network Systems 2.0 Design Guide** from <u>www.cisco.com</u>.

- 7. Select the **Save to Device** button.
- 8. Copy the QUEUEING policy to the **other devices via Copy Policy to Devices** icon.

Copy Policy to Devices	×
Select a policy:	
QUEUEING	•
Select the devices to which you v	vant to save this policy:
Branch1-LA.dcloud.cisco.com	(198.19.1.1)
Branch2-NY.dcloud.cisco.com	· · · ·
	OK Cancel

9.	When the	conflict	warning	appears,	select	overwrite.
----	----------	----------	---------	----------	--------	------------

Copy Policy to Devices	×
Conflicts were encountered when saving the policy on device Branch1-LA.dcloud.cisco.com (198.19.1.1). The policy is shown below, with conflicting settings highlighted in red. Do you want to continue?	
QUEUEING - Overwritten (A policy with the same name exists) VOICE Queueing: Priority 160 Kbps Match DSCP "46 (EF)" VIDEO Queueing: Priority 800 Kbps Match DSCP "34 (AF41)" HIGH_PRIORITY_DATA Queueing: Class-based 64 Kbps Match DSCP "26 (AF31)" SCAVENGER Queueing: Class-based 8 Kbps	
View all conflicts Perform this action for all devices which have conflicts	
Overwrite Skip Cancel	
10. Validate the changes saved successfully.	

Copy Policy to Devices	×
Saving to devices	
Branch1-LA.dcloud.cisco.com (198.19.1.1) Branch2-NY.dcloud.cisco.com (198.19.2.1)	-
	Cancel

11. Close the Manage QoS Settings Dialog window.

Lab 7

Lab 7: QoS Alerts

Lab 7.1: Configure QoS Alerts

QoS Alerting is an integral LiveNX component for managing and troubleshooting the system.

Alerting is a balancing act of noise vs actionable data. LiveNX default settings work well in many organizations for providing a balanced approach. Often, it is best to tune the alerting mechanism further to get the most from the solution.

Whenever LiveNX detects a QoS performance issue, the tool will show the respective device, interface, and class, as well as change color to amber. An alert will also be generated. Below is an example of the LiveNX **In-Application Alerts** view:

016/10/24 01:46:04 AM Warning Branch1-LA Interface Up/Down Interface error Interface name - Ethernet0(0); Interface direction - UDTPUT; Policy name - QUELING; Gass dropped rate 016/10/24 01:46:32 AM Warning HQ-53 Qo5 Class dropped rate CLEARED: Interface name - Ethernet0(1); Interface direction - OUTPUT; Policy name - QUELING; Class name 016/10/24 01:47:33 AM Warning HQ-53 Qo5 Class dropped rate CLEARED: Interface name - Ethernet0(1); Interface direction - OUTPUT; Policy name - MULTI_CLASS_SHAPING; Class name 016/10/24 01:47:33 AM Warning Branch1-LA Device Config Cha De	Time	△ Severity	Device	Group	Alert Type	Details
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116/10/24 02:07:06 AM Warning Branch1-LA QoS Class dropped rate CLEARED: Interface name - Ethernet0/0; Interface direction - UNPUT; Policy name - SET_DSCP_LAN; Class name 116/10/24 02:07:23 AM Warning HQ-53 QoS Class dropped rate CLEARED: Interface name - Ethernet0/0; Interface direction - OUTPUT; Policy name - MULTCLASS_SHAPING; Class name 116/10/24 02:08:03 AM Warning HQ-53 QoS Class dropped rate CLEARED: Interface name - Ethernet0/1; Interface direction - OUTPUT; Policy name - MULTCLASS_SHAPING; Class name 116/10/24 02:08:03 AM Warning HQ-53 QoS Class dropped rate CLEARED: Interface name - Ethernet0/1; Interface direction - OUTPUT; Policy name - MULTCLASS_SHAPING; Class name 116/10/24 02:09:03 AM Warning HQ-53 QoS Class dropped rate CLEARED: Interface name - Ethernet0/1; Interface direction - OUTPUT; Policy name - MULTICLASS_SHAPING; Class name 116/10/24 02:09:03 AM Warning HQ-53 QoS Class dropped rate CLEARED: Interface name - Ethernet0/1; Interface direction - OUTPUT; Policy name - MULTICLASS_SHAPING; Class name Interface name - Ethernet0/1; Inte)16/10/24 02:06:55 AM	Warning	Branch1-LA	QoS	Class dropped rate	Interface name - Ethernet0/0; Interface direction - INPUT; Policy name - SET_DSCP_LAN; Class name - SET_DS
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116/10/24 02:09:23 AM Warning H2-S1 QdS Class dropped rate CLEARED: Interface name - Ethernet0/1; Interface direction - NPUT; Policy name - SET_DSCP_LAN; Class name - SET_DSCP_LAN; Clas	016/10/24 02:09:03 AM	Warning	HQ-SJ	QoS	Class dropped rate	Interface name - Ethernet0/1; Interface direction - OUTPUT; Policy name - MULTI_CLASS_SHAPING; Class name
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D16/10/24 02:10:03 AM Warning HQ-S1 QoS Class dropped rate Interface name - Ethernet0/0; Interface direction - INPUT; Policy name - SET_DSCP_LAN; Class name - SET_DSCP_LAN; SCAS name - SET_DSCP_LAN; SCAS name - S	016/10/24 02:09:33 AM	Warning	HQ-SJ	Qo5	Class dropped rate	Interface name - Ethernet0/0; Interface direction - INPUT; Policy name - SET_DSCP_LAN; Class name - SET_DS
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116/10/24 02:11:03 AM Warning HQ-SJ QoS Class dropped rate Interface name - Ethernet0/0; Interface direction - INPUT; Policy name - SET_DSCP_LAN; Class name - SET_DSCP_LAN; Since name - SET_DSCP_LAN; Class name -	016/10/24 02:10:03 AM	Warning	HQ-SJ	QoS	Class dropped rate	Interface name - Ethernet0/0; Interface direction - INPUT; Policy name - SET_DSCP_LAN; Class name - SET_DS
116/10/24 02:11:13 AM Warning HQ-SJ QoS Class dropped rate CLEARED: Interface name - Ethernet0/0; Interface direction - INPUT; Policy name - SET_DSCP_LAN; Class name 116/10/24 02:11:13 AM Warning HQ-SJ QoS Class dropped rate Interface name - Ethernet0/1; Interface direction - OUTPUT; Policy name - MULTI_CLASS_SHAPING; Class name 116/10/24 02:11:23 AM Warning HQ-SJ QoS Class dropped rate CLEARED: Interface name - Ethernet0/1; Interface direction - OUTPUT; Policy name - MULTI_CLASS_SHAPING; Class name 116/10/24 02:11:23 AM Warning HQ-SJ QoS Class dropped rate CLEARED: Interface name - Ethernet0/1; Interface direction - OUTPUT; Policy name - MULTI_CLASS_SHAPING; ly the last 100 alerts are shown.	16/10/24 02:10:13 AM	Warning	HQ-SJ	Qo5	Class dropped rate	CLEARED: Interface name - Ethernet0/0; Interface direction - INPUT; Policy name - SET_DSCP_LAN; Class name
116/10/24 02:11:13 AM Warning HQ-5J QoS Class dropped rate Interface name - Ethernet0/1; Interface direction - OUTPUT; Policy name - MULTI_CLASS_SHAPING; Class name 16/10/24 02:11:23 AM Warning HQ-5J QoS Class dropped rate CLEARED: Interface name - Ethernet0/1; Interface direction - OUTPUT; Policy name - MULTI_CLASS_SHAPING; ily the last 100 alerts are shown. Bring this window to the front when a new alert is received	016/10/24 02:11:03 AM	Warning	HQ-SJ	Qo5	Class dropped rate	Interface name - Ethernet0/0; Interface direction - INPUT; Policy name - SET_DSCP_LAN; Class name - SET_DS
116/10/24 02:11:23 AM Warning HQ-SJ QoS Class dropped rate CLEARED: Interface name - Ethernet0/1; Interface direction - OUTPUT; Policy name - MULTI_CLASS_SHAPING; ily the last 100 alerts are shown. T Bring this window to the front when a new alert is received	016/10/24 02:11:13 AM	Warning	HQ-SJ	Qo5	Class dropped rate	CLEARED: Interface name - EthernetO/0; Interface direction - INPUT; Policy name - SET_DSCP_LAN; Class name
ly the last 100 alerts are shown. Bring this window to the front when a new alert is received	016/10/24 02:11:13 AM	Warning	HQ-SJ	Qo5	Class dropped rate	Interface name - Ethernet0/1; Interface direction - OUTPUT; Policy name - MULTI_CLASS_SHAPING; Class name
Bring this window to the front when a new alert is received)16/10/24 02:11:23 AM	Warning	HQ-SJ	Qo5	Class dropped rate	CLEARED: Interface name - Ethernet0/1; Interface direction - OUTPUT; Policy name - MULTI_CLASS_SHAPING;
	ly the last 100 alerts are s	hown.				
Beep when a new alert is received	Bring this window to the	front when a ne	w alert is receive	ed		
beep wile it a new aler is received	Roop when a new alert is	racainad				
	beep when a new alert is	received				

The following Lab directs you to create an Alert when QoS problems are detected.

Lab Steps:

1. Tools > Configure Alerts

The default QoS alerts are highlighted below. These settings work well in many environments.

Routina Triaa		Custom Triggers	Notification	j Syslo
Device	/QoS Triggers	Flow Triggers	IP SLA Trig	gers
Generate an alert	when			
Device Down —				
✓ Warning	A device becomes una	vailable		
CPU and Memor				
Warning	A device's CPU usage	reaches or exceeds (>=) 80	%	
Warning	A device's memory usa	age reaches or exceeds (>=)	90 %	
-Device Config C	hange and Access			
Marning	The running config cha	anged time is later than the st	artup config change	d time
Warning	Commands are sent to	a device using the monitor-or	nly CLI credentials	
✓ Warning	The device configurati	ion has been changed by Live/	Action	
- Interface Errors	;			
Warning	An interface becomes	unavailable		
🔲 Warning	An interface has error	s (CRC, Frame, Oven on, Igno	ore, Abort)	
QoS Drops				
Configuring the	e following alert triggers will af	fect the drop status for device	es and interfaces.	
Warning	Interface drop rate e>	<pre><ceeds (="">) 2,500.000 </ceeds></pre>	pps	
🗖 G	enerate events only for select	ted interfaces		
✓ Warning	Class drop rate excee	ds (>) 0.000 Kbps	;	
Warning	Class-default drop rat	e exceeds (>) 1,500.000	 Kbps	
Help			ОК	Cancel

Note: If a network uses policers, it is often best to tune the global Class drop rate exceeds setting.

In the example below it has been changed from 0 to 1500. This means that all classes that drop data, including high priority classes like VOICE and VIDEO, will not alert *unless* they drop at a rate greater than 1500Kbps.

🛕 Conf	ìgure Aler	ts						
Ro	utina Triaae Device/		LAN Triaders	Ĭ	Custom Trigger Flow Triggers	's	Notification IP SLA T	Syslog riggers
Genera	ite an alert i	when						
[Devic	e Down —							
V	Warning	-	A device becomes u	inavaila	ble			
-CPU (and Memory	,						
v	Warning	-	A device's CPU usag	je react	nes or exceeds (>	=) 80	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	
v	Warning	-	A device's memory u					
	Indiana		H dovice 5 monory e	uougo n		,,,_,	100 10	
Devic	e Config Ch	ange	and Access					
	Warning	-	The running config a	thanged	d time is later than	the sta	artup config chan	ged time
	Warning		Commands are sent	to a de	vice usina the mo	nitor-or	nlv CLI credential	s
N	Warning		The device configura		-			
	Iwaning		The device conligat	adonna	as been changed t			
Inter	face Errors							
	Warning	-	An interface become	es unav	ailable			
	Warning		An interface has err	rors (CR	C. Frame, Overru	ın. Iana	ore, Abort)	
	1	_						
[QoS I	Drops ——							
Conf	figuring the	follov	ving alert triggers will				es and interfaces	
	Warning	v	Interface drop rate	exceed	ls (>) 2,500.000	F	ops	
	🗖 Ge	nerat	e events only for sel	ected in	terfaces			
	Warning	-	Class drop rate exce	eeds (>) 1,500.000	Kbps		
▼	Warning	•	Class-default drop r	die ext		000	Kbps	
		_	·		· · · · ·			
He	lp						ок	Cancel

To modify this condition and ensure VIOCE and VIDEO classes still alert if there are any drops:

- 2. Select the **Custom Triggers** tab.
- 3. Click Add.

🛕 Configure	Alerts				×
De	vice/QoS Trigo	gers	Flow Triagers	IP SLA Tri	iggers 🔰
Routing T	riggers 📔	LAN Triggers	Custom Triggers	Notification	Syslog
			Add	Edit	Delete
I					
I					
I					
I					
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I					
I					
I					
4. Cre	eate a cust	tom trigger type	Class and set it with	the following	parameters:

- Filter = leave blank
- Class name = VOICE
- Direction = Output
- Traffic type = Drop
- Operator = greater than
- Value = 0

Add Custor	n Trigger 🛛 🗙
Type Class	•
Filter	Example: device = router1 & wan
Class name	VOICE
Direction	Output
Traffic type	Drop
Operator	greater than
Value	0 kbps
Syslog Severity	Warning
	OK Cancel

5. Click OK.

🛕 Configure Alerts				×
Device/QoS Trig	ggers	Flow Triagers	IP SLA T	riggers
Routing Triggers	LAN Triggers	Custom Triggers	Notification	Syslog
		Add	Edit	Delete
Class: Class dropped packe	ts for output directi	on of VOICE is greater than 0.	.0 kbps	

6. Repeat these steps and create a Custom trigger for the VIDEO and HIGH_PRIORITY_DATA classes.

This will ensure these classes always alert when drops occur.

Configure Alerts				×
Device/QoS Trig	ggers	Flow Triagers	IP SLA TI	riggers
Routing Triggers	LAN Triggers	Custom Triggers	Notification	Syslog
		Add	Edit	Delete
Class: Class dropped packe	ts for output direction	of VOICE is greater than 0.0) kbps	
Class: Class dropped packe	ts for output direction	of VIDEO is greater than 0.0) kbps	
Class: Class dropped packe	ts for output direction	of HIGH_PRIORIY_DATA is (greater than 0.0 k	bps

7. After the alert thresholds have been updated, open the **In Applications Alert** view. At the bottom left of the LiveNX window, Double click the alert button. In this example the Alert button is red, indicating that a new alert has been received.

Time	△ Severity	Device	Group	Alert Type	Details
2016/10/24 01:46:02 AM	Warning	HQ-SJ	Qo5	Class dropped rate	Interface name - Ethernet0/1; Interface direction - OUTPUT; Policy name - MULTI_CLASS_SHAPING; Class name
2016/10/24 01:46:04 AM	Warning	Branch1-LA	Interface Up/Down	Interface error	Interface name - Ethernet0/0; Interface direction - Input; Error rate - 0.30150753
2016/10/24 01:46:32 AM	Warning	HQ-SJ	QoS	Class dropped rate	Interface name - EthernetO/1; Interface direction - OUTPUT; Policy name - QUEUEING; Class name - VIDEO; T
2016/10/24 01:46:43 AM	Warning	HQ-SJ	QoS	Class dropped rate	CLEARED: Interface name - Ethernet0/1; Interface direction - OUTPUT; Policy name - QUEUEING; Class name
2016/10/24 01:47:03 AM	Warning	HQ-SJ	QoS	Class dropped rate	CLEARED: Interface name - Ethernet0/1; Interface direction - OUTPUT; Policy name - MULTI_CLASS_SHAPING;
2016/10/24 01:47:33 AM	Warning	HQ-SJ	QoS	Class dropped rate	Interface name - Ethernet0/1; Interface direction - OUTPUT; Policy name - MULTI_CLASS_SHAPING; Class name
2016/10/24 01:48:13 AM	Warning	HQ-SJ	QoS	Class dropped rate	CLEARED: Interface name - Ethernet0/1; Interface direction - OUTPUT; Policy name - MULTI_CLASS_SHAPING;
2016/10/24 02:06:32 AM	Warning	Branch1-LA	Device Config Cha	Device configuration c	Username - admin; Commands - show privilege; terminal length 0; terminal width 0; enable; ***; config t; class-ma
2016/10/24 02:06:43 AM	Warning	Branch2-NY	Device Config Cha	Device configuration c	Username - admin; Commands - show privilege; terminal length 0; terminal width 0; enable; ***; config t; class-ma
2016/10/24 02:06:55 AM	Warning	Branch1-LA	QoS	Class dropped rate	Interface name - EthernetO/0; Interface direction - INPUT; Policy name - SET_DSCP_LAN; Class name - SET_DS
2016/10/24 02:06:57 AM	Warning	HQ-SJ	Device Config Cha	Device configuration c	Username - admin; Commands - show privilege; terminal length 0; terminal width 0; enable; ***; config t; class-ma
2016/10/24 02:07:06 AM	Warning	Branch1-LA	QoS	Class dropped rate	CLEARED: Interface name - Ethernet0/0; Interface direction - INPUT; Policy name - SET_DSCP_LAN; Class name
2016/10/24 02:07:23 AM	Warning	HQ-SJ	QoS	Class dropped rate	Interface name - Ethernet0/1; Interface direction - OUTPUT; Policy name - MULTI_CLASS_SHAPING; Class name
2016/10/24 02:07:33 AM	Warning	HQ-SJ	QoS		CLEARED: Interface name - Ethernet0/1; Interface direction - OUTPUT; Policy name - MULTI_CLASS_SHAPING;
2016/10/24 02:08:03 AM	Warning	HQ-SJ	QoS	Class dropped rate	Interface name - EthernetO/1; Interface direction - OUTPUT; Policy name - MULTI_CLASS_SHAPING; Class name
2016/10/24 02:08:23 AM	Warning	HQ-SJ	Qo5	Class dropped rate	CLEARED: Interface name - Ethernet0/1; Interface direction - OUTPUT; Policy name - MULTI_CLASS_SHAPING;
2016/10/24 02:09:03 AM	Warning	HQ-SJ	Q05		Interface name - Ethernet0/0; Interface direction - INPUT; Policy name - SET_DSCP_LAN; Class name - SET_DS
2016/10/24 02:09:03 AM	Warning	HQ-SJ	QoS		Interface name - Ethernet0/1; Interface direction - OUTPUT; Policy name - MULTI_CLASS_SHAPING; Class name
2016/10/24 02:09:23 AM	Warning	HQ-SJ	QoS	Class dropped rate	CLEARED: Interface name - Ethernet0/0; Interface direction - INPUT; Policy name - SET_DSCP_LAN; Class name
2016/10/24 02:09:23 AM	Warning	HQ-SJ	QoS		CLEARED: Interface name - Ethernet0/1; Interface direction - OUTPUT; Policy name - MULTI_CLASS_SHAPING;
2016/10/24 02:09:33 AM	Warning	HQ-SJ	QoS		Interface name - Ethernet0/0; Interface direction - INPUT; Policy name - SET_DSCP_LAN; Class name - SET_DS
2016/10/24 02:09:43 AM	Warning	HQ-SJ	QoS		CLEARED: Interface name - Ethernet0/0; Interface direction - INPUT; Policy name - SET_DSCP_LAN; Class name
2016/10/24 02:10:03 AM	Warning	HQ-SJ	QoS		Interface name - Ethernet0/0; Interface direction - INPUT; Policy name - SET_DSCP_LAN; Class name - SET_DS
2016/10/24 02:10:13 AM	Warning	HQ-SJ	Qo5		CLEARED: Interface name - Ethernet0/0; Interface direction - INPUT; Policy name - SET_DSCP_LAN; Class name
2016/10/24 02:11:03 AM	Warning	HQ-SJ	QoS		Interface name - Ethernet0/0; Interface direction - INPUT; Policy name - SET_DSCP_LAN; Class name - SET_DS
2016/10/24 02:11:13 AM	Warning	HQ-SJ	QoS		CLEARED: Interface name - Ethernet0/0; Interface direction - INPUT; Policy name - SET_DSCP_LAN; Class name
2016/10/24 02:11:13 AM	Warning	HQ-SJ	QoS		Interface name - Ethernet0/1; Interface direction - OUTPUT; Policy name - MULTI_CLASS_SHAPING; Class name
2016/10/24 02:11:23 AM	Warning	HQ-SJ	QoS	Class dropped rate	CLEARED: Interface name - Ethernet0/1; Interface direction - OUTPUT; Policy name - MULTI_CLASS_SHAPING;

Only the last 100 alerts are show

 $\ensuremath{{\textstyle\square}}$ Bring this window to the front when a new alert is received

 $\hfill\square$ Beep when a new alert is received

Clear list Export list Historical search Configure alerts

8. Click the Clear List Button

Δ	In-Application Alerts					
[Time	△ Severity	Device	Group	Alert Type	Details
						<u>▼</u>
	Only the last 100 alerts a					
	Bring this window to		alert is received			
	Eeep when a new ale	ert is received				
						Clear list kport list Historical search Configure alerts

Monitor the system for any **new** QoS Alerts.

Lab A

Lab A: Appendix

Lab A.1: Add Device

Adding devices into LiveAction and managing them properly is very important to the overall usability of LiveAction itself.

Lab Steps:

9. Select File, Add Device

🔜 198.18.133.34 - Remote Desktop								
🛕 Li	🛦 LiveAction - localhost							
File	View	Users	QoS	Flow	Rou			
Add Device								
	Discover Devices							
Import Devices								
Export Devices								
Manage Devices								
Refresh Devices								
Remove Network Objects								
	Exit							
1								

10. Enter 198.19.1.1 in the IP Address field.

11. Select "Use the Default SNMP connection settings".

dd	Device		Local ✓ 198, 19, 1, 1 ✓ such as NetFlow probes Edit SNMP connection settings Edit nection settings for this device Version 2c Version 2c Varget Port	
Ste	ps	Device Connection Inf	ormation	
1.	Device Connection Information	Enter the SNMP conne	ction information.	
2.	CLI Settings (Configuring)	Node	Local	~
	CLI Settings (Monitoring) Select Interfaces	IP Address	198.19.1.1	
5.	Select VLANs	O Non SNMP device	such as NetFlow probes	
6.	Select Features	◯ LiveSensor		
7.	Enable Polling	Ose the Default Si	NMP connection settings	Edit
8.	Review Configuration	O Enter SNMP conne	ection settings for this device	
9.	Device Updated	SNMP Version	Version 2c	V Target Port 161
		Community String		
		< Back Next >	> Finish	Cancel Help

13. Select "Use m	v default	Configuration	CLI	connection	settinas".

dd Device - HQ-SJ.dcloud.cis	co.com (198.18.129.25)
Steps	CLI Settings (Configuring)
1. Device Connection Information	Specify the CLI connection information used for configuring these devices. Required fields are indicated wit an asterisk (*).
2. CLI Settings (Configuring)	⊂Configuration CLI Connection Settings
3. CLI Settings (Monitoring)	Enter Command Line Interface (CLI) connection settings used to configure these devices.
 Select Interfaces 	C Add as monitor only device for non Cisco and unsupported Cisco OS (IOS, IOS-XE and NX-OS supp
5. Select VLANs 5. Select Features	Use my default Configuration CLI connection settings Edit
7. Enable Polling	C Enter connection settings for this device
 Review Configuration 	Connection Type S5H 🔽 Port* 22
9. Device Updated	User name on Device
	Password on Device*
	Enable Password
	Also use these credentials for monitor mode.
	< Back Next > Finish Cancel Help

steps CLI Settings (Monitoring) 1. Device Connection Information Specify the CLI connection information shared by all users. This information will only be used to monitor the device. Required fields are indicated with an asterisk (*). 2. CLI Settings (Configuring) Monitor-only CLI Connection Settings (Monitoring) 4. Select Interfaces Enter Command Line Interface (CLI) connection settings 5. Select VLANs Ise the default Monitor-only CLI connection settings 6. Select Features Use the previous page connection settings 7. Enable Polling Connection Type 8. Review Configuration User name on Device 9. Device Updated Password on Device* Enable Password Enable Password	ld Device - HQ-SJ.dcloud.cise	
	Information 2. CLI Settings (Configuring) 3. CLI Settings (Monitoring) 4. Select Interfaces 5. Select VLANs 6. Select Features 7. Enable Polling 8. Review Configuration	device. Required fields are indicated with an asterisk (*). Monitor-only CLI Connection Settings Enter Command Line Interface (CLI) connection settings used to monitor this device. Use the default Monitor-only CLI connection settings Edit Use the previous page connection settings Enter connection settings for this device Connection Type User name on Device Password on Device*

- 15. Select "Use the previous page connection settings".
- 16. Click Next.

You can verify what capabilities LiveAction is able to interact with the device.

17. Click Continue.

Test	Status	Description	
5NMP connection		Succeeded	
5NMP access		Succeeded	
CLI configure connection	\odot	Skipped	
CLI configure login	\odot	Skipped	
CLI configure enable password	\odot	Skipped	
CLI monitor connection	\odot	Skipped	
CLI monitor login	\odot	Skipped	
CLI monitor enable password	\odot	Skipped	
Serial number validation	•	Succeeded	
Model supported	•	Succeeded	
IOS supported	•	Succeeded	
NBAR capable	•	Succeeded	
NBAR2 capable	٠	Succeeded	
NetFlow collector configure supported	٠	Succeeded	
Flexible NetFlow supported		Succeeded	
Unified Perfmon supported		Succeeded	
Medianet Performance Monitoring supported		Succeeded	
AVC supported	•	Succeeded	
MLS NetFlow configure supported	\odot	Not supported	
Mediatrace configure supported	•	Succeeded	
IP SLA Supported		Succeeded	
HQF Supported	•	Succeeded	
MAC Table Supported	\odot	Not supported	

On the select interfaces window you may notice 3 interfaces are already selected. LiveAction automatically selects the interfaces based on the highest bit rate.

eps	56	elect Interfac	es			
. Device Connection Information	Se	elect the inter	faces you want to	monitor on this de	vice (maximum 100	0 interfaces).
2. CLI Settings (Configuring)		Selected	Interface	Trunk	IP Address	Description
8. CLI Settings (Monitoring)			Ethernet0/0		198.18.129.25	
. Select Interfaces		<u>য</u>	Ethernet0/1 Loopback0		10.255.0.2 10.0.0.102	
i. Select VLANs			NullO		1010101102	
. Select Features			Tunnel0			PFR auto-tunnel for VRF default
. Enable Polling			VoIP-Null0			
Review Configuration						
). Device Updated						
		Selected inte	rfsra(r), 3			
		Selected inte	rface(s): 3			

Note: Since there are no VLANs configured on this device, none will be displayed. You may monitor up to 25 configured VLANs on each device.

Add Device - HQ-SJ.dcloud.cis	co.com (198.18.129.25) 🛛 🗙
Steps	Select VLANs
Steps 1. Device Connection Information 2. CLI Settings (Configuring) 3. CLI Settings (Monitoring) 4. Select Interfaces 5. Select VLANs 6. Select Features 7. Enable Polling 8. Review Configuration 9. Device Updated	Select VLANs you want to monitor on this device (maximum 25 VLANs).
	< Back Finish Cancel Help

19. Click Next.

The **Select Features** dialog allows you to turn-on specific Cisco technologies using the templates included in LiveNX. This dialog displays the current IOS configuration of the device you are currently viewing. Leave this screen **AS-IS**.

eps	Select Features		
 Device Connection Information 	Select the features you want to enabl section.	e on each interface. Learn more -	about each feature in the Help
 CLI Settings (Configuring) CLI Settings (Monitoring) Select Interfaces Select VLANs Select Features Enable Polling Review Configuration Device Updated 	Features on device Enable Mediatrace Associate Probe at IP Address: Interface Ethernet0/1 Ethernet0/0 Loopback0	NBAR V V	NetFlow V V
			ß
	< Back Next > Finish		Cancel Help

21. Change the polling rate to 30 seconds.

22. Verify that ONLY the **Flow** & **QoS** boxes remain checked.

iteps	Enable Polling
1. Device Connection Information	Select the features you want to actively monitor and the polling rate for all the features on this device. Learn more about polling in the Help section.
2. CLI Settings (Configuring)	
3. CLI Settings (Monitoring)	
4. Select Interfaces	
5. Select VLANs	Polling Rate 30 seconds
5. Select Features	Dull the Collection Continues
7. Enable Polling	Poll the following features
3. Review Configuration	
). Device Updated	QoS
	IF SLA
	Routing
	LAN*
	* LAN polling occurs every 15 minutes * For SNMP v3, please see the User Guide on configuring LAN polling.
	k3
	< Back Next > Finish Cancel Help

Note: Any changes to the Select Features dialog will generate a CLI push to update the current configuration. Before sending the NetFlow configurations to the device, you can verify the configurations that LiveAction created.

-	
iteps	Review Configuration
1. Device Connection Information	The following commands will be sent to the device. Or you can choose to manually configure the device yourself.
2. CLI Settings (Configuring)	
 CLI Settings (Monitoring) Select Interfaces Select VLANs Select Features Enable Polling Review Configuration Device Updated 	<pre>description D0 NOT MODIFY. USED BY LIVEACTION. exporter LIVEACTION-FLOWEXPORTER cache timeout inactive 10 cache timeout active 60 record LIVEACTION-FLOWRECORD exit interface Ethernet0/1 ip flow monitor LIVEACTION-FLOWMONITOR input ip flow monitor LIVEACTION-FLOWMONITOR output exit interface Ethernet0/0 ip flow monitor LIVEACTION-FLOWMONITOR input ip flow monitor LIVEACTION-FLOWMONITOR input ip flow monitor LIVEACTION-FLOWMONITOR output</pre>
	<pre>exit interface Loopback0 ip flow monitor LIVEACTION-FLOWMONITOR input ip flow monitor LIVEACTION-FLOWMONITOR output • Send the configuration commands to device. C I will manually configure the device myself.</pre>

- 23. Select "Send the configuration..." radio button, if available.
- 24. Click Next.

25. Click Finish.

teps	Device Updated		
 Device Connection Information 	You have configured this device success configuration to the device's startup cor		
2. CLI Settings (Configuring)	Device Settings		
3. CLI Settings (Monitoring)	-		
4. Select Interfaces	Setting Polling Rate		Description 30 seconds
i. Select VLANs	NetFlow Monitoring		NetFlow collector
5. Select Features	NetFlow Polling		Enabled
	Mediatrace		Disabled
7. Enable Polling	Adjacency Polling		Enabled
Review Configuration	Qos Polling		Enabled
9. Device Updated	IP SLA Polling CEF		Enabled Enabled
	Interface Settings		
	Interface	NBAR	NetFlow
	Ethernet0/1		•
	Ethernet0/0 Loopback0		
		•	v
	< Back Next > Finish		Cancel Help

The device will be added to the Topology Pane in LiveNX. Note that LiveNX will not automatically position a new device with reference to any existing devices... you may need to scroll-about in the Topology Pane to locate your new device(s).

Lab A.2: Client Device Discovery

As we discovered in a prior Lab, the LiveNX Server in your topology has had device(s) preinstalled. In the following Lab you may add additional devices to your Topology, configure those devices to send flow and SNMP data to the LiveNX Server, and discover what data your LiveNX solution is gathering.

Lab Steps:

Adding several devices at once is as easy as adding a single device at a time. To do this:

26. Select File and Discover Devices.

🔜 198.18.133.34 - Remote Deskto					kto
🔺 Liv	veActio	on - loca	alhost		
File	View	Users	QoS	Flow	Re
	Add De	vice			
	Discove	er Device	s		
Import Devices					
Export Devices					
	Manage	e Devices	5		
Refresh Devices					
Remove Network Objects					
Exit					

- 27. Specify the following IP addresses: 198.19.1.1 198.19.2.1
- 28. Select Use the default SNMP connection settings.

Device Discovery	×
Step 1: Specify w	hat to scan
Specify IP ranges	(ex: 192.168.1.1-200) or one IP per line:
198.19.1.1 198.19.2.1	
C Specify seed devi	ice to scan
IP Address	Hops 1
Step 2: Specify SM • Use the Default S	IMP settings IMP connection settings Edit
C Enter SNMP conn	ection settings for this device
SNMP Version	Version 2c Target Port 161
Community String	

Note: In the Lab infrastructure we are utilizing the Local LiveNX Node included with the Server installation. If you require access to a Remote Node to access the subnets or addressing in "Step 1: Specify what to scan" you would use the Specify node drop-down at the bottom of this dialog box.

Step 3: Specify node		
Local		v
	ОК	Cancel

- 29. Click OK.
- 30. Verify that both devices were found, and then select Add Devices.

Note: LiveNX may only discover a single router in the above steps. Your Student Pod may already be pre-configured with multiple devices. Your instructor may direct you to add one or more devices in this



A Device Discover	y on Local				X
Filter by:		Filter	Clear		
Select	Device Name	IP Address	Hops	Vendor	Model
	Branch2-NY.dcloud.cisco.com	198.19.2.1	0	Cisco	ciscoGatewayServer
	Branch1-LA.dcloud.cisco.com	198.19.1.1	0	Cisco	ciscoGatewayServer
Selected: 2	Discovered: 2 Device Limit: 10,0	00,000 (1 active devices)			
		Add Devices Advan	ced Add	Pause	Stop

31. Select Yes on the configure devices dialog.



32. Use the default SNMP connection settings and then select Next

Note: You must be logged-in as the original admin user so that the LiveNX Wizard will inherit the appropriate credentials. Ask your instructor for clarification on this, if desired.

onfigure Cisco Devices		
Steps	SNMP Settings	
 SNMP Settings CLI Settings (Configuring) CLI Settings (Monitoring) Validating Devices Select Features Enable Polling Update Device Devices Configured 	Enter the SNMP connection information used for monitoring the selected devices.	
	< Back Next > Finish Cancel He	lp

- 33. Select Use my default Configuration CLI connection settings.
- 34. Click next.

eps	CLI Settings (Configuring)
. SNMP Settings . CLI Settings (Configuring)	Specify the CLI connection information used for configuring these devices. Required fields are indicated with an asterisk (*).
. CLI Settings (Monitoring)	Configuration CLI Connection Settings
. Validating Devices	Enter Command Line Interface (CLI) connection settings used to configure these devices.
. Select Features	C Add as monitor only device for non Cisco and unsupported Cisco OS (IOS, IOS-XE and NX-OS supp
. Enable Polling	Use my default Configuration CLI connection settings Edit
. Update Device	C. Enter connection settings for this device
. Devices Configured	Connection Type SSH V Port* 22
	User name on Device
	Password on Device*
	Enable Password
	Also use these credentials for monitor mode,
	L ² S

35. Select Use the previous page connection settings.

Configure Cisco Devices	x
Steps	CLI Settings (Monitoring)
 SNMP Settings CLI Settings (Configuring) 	Specify the CLI connection information shared by all users. This information will only be used to monitor this device. Required fields are indicated with an asterisk (*).
 CLI Settings (Monitoring) Validating Devices Select Features Enable Polling Update Device Devices Configured 	Monitor-only CLI Connection Settings Enter Command Line Interface (CLI) connection settings used to monitor this device. Use the default Monitor-only CLI connection settings Enter connection spage connection settings Enter connection settings for this device Connection Type User name on Device Password on Device* Enable Password
	< Back Next > Finish Cancel Help

36. Click Next

37. After verifying that the device validation is successful, Click Next.

1. SNMP Settings			
	The following devices are being validated. You		
2. CLI Settings (Configuring)	validation issue occurs, click on the description	field to view addit	ional details.
3. CLI Settings (Monitoring)			
4. Validating Devices	Device Branch1-LA.dcloud.cisco.com	Status	Description Succeeded: click for details
5. Select Features	Branch2-NY.dcloud.cisco.com		Succeeded: click for details
6. Enable Polling			
7. Update Device			
8. Devices Configured			
	,		
	Export Validation Details		
	< Back Next > Finish		Cancel Help

Configure Cisco Devices				×
Steps	Select Features			
 SNMP Settings CLI Settings (Configuring) 	Select the features you want to use on the	devices. Learn more	about each feature i	in the Help section.
3. CLI Settings (Monitoring)	Device	NBAR	NetFlow	Mediatrace
	Branch1-LA.dcloud.cisco.com	V		
4. Validating Devices	Branch2-NY.dcloud.cisco.com			
5. Select Features				
6. Enable Polling				
7. Update Device				
8. Devices Configured				
-				
	< Back Next > Finish		Ca	ncel Help

38. Select NBAR and NetFlow for both devices, Click Next.

- 39. Select all technologies excepting LAN.
- 40. Set the interval to 30 seconds for each device, Click Next.

onfigure Cisco Devices	
Steps	Enable Polling
1. SNMP Settings	Select the features you want to actively monitor, and the polling rate for the devices. Learn more about
2. CLI Settings (Configuring)	each feature in the Help section.
3. CLI Settings (Monitoring)	
4. Validating Devices	Device Poll QoS Flow IP SLA Routing LAN* Interval
5. Select Features	Branch1-LA.dcloud.cisco.com V V V V 30 seconds S Branch2-NY.dcloud.cisco.com V V V V V 30 seconds S
5. Enable Polling	
7. Update Device	
8. Devices Configured	
	La contraction de la contracti
	* LAN polling occurs every 15 minutes * For SNMP v3, please see the User Guide on configuring LAN polling. < Back Next > Finish Cancel Help

Note: For our class Labs we are gathering data every 30 seconds to reduce wait time when we make changes. In a production environment this may generate more network traffic than desired.

41. Select Send Updates to Devices and click Send.

onfigure Cisco Devices			
teps	Update Device		
 SNMP Settings CLI Settings (Configuring) CLI Settings (Monitoring) Validating Devices 	The selected devices will be updated base You may choose to manually configure th Warning: once update processes have be more about each feature in the Help sect	ne devices. een started you will no	n changes if necessary. t be able to return to earlier screens. Lear
5. Select Features	Device	Status	Description
6. Enable Polling	Branch1-LA.dcloud.cisco.com	•	Update Required: click to view
. Update Device	Branch2-NY.dcloud.cisco.com		Update Required: click to view
	Send Updates to Devices	end	
	C Manually Configure Devices		
	Export Update Commands		
	<back next=""> Finish</back>		Cancel H

42. Once the updates are pushed successfully, click next.

Update Device			
You may choose to manually configure the o Warning: once update processes have been	devices. started you will not		;. Lear
Device	Status	Description	
Branch1-LA.dcloud.cisco.com	•	Update Successful	
Branch2-NY.dcloud.cisco.com	•	Update Successful	
Send Updates to Devices Send	1		
C Manually Configure Devices			
Export Update Commands			
	The selected devices will be updated based You may choose to manually configure the of Warning: once update processes have been more about each feature in the Help section Device Branch1-LA.dcloud.cisco.com Branch2-NY.dcloud.cisco.com	The selected devices will be updated based on the configuration You may choose to manually configure the devices. Warning: once update processes have been started you will not more about each feature in the Help section. Device Status Branch1-LA.dcloud.cisco.com Branch2-NV.dcloud.cisco.com	The selected devices will be updated based on the configuration changes if necessary. You may choose to manually configure the devices. Warning: once update processes have been started you will not be able to return to earlier screener more about each feature in the Help section. Device Status Description Branch1-LA.dcloud.cisco.com Update Successful Branch2-NY.dcloud.cisco.com Update Successful @ Send Updates to Devices Send @ Manually Configure Devices

43. Click finish to add the devices into the topology.

Configure Cisco Devices		×
Steps	Devices Configured	
 SNMP Settings CLI Settings (Configuring) 	The following devices have been configured. Le	earn more about each feature in the Help section.
 CLI Settings (Monitoring) Validating Devices Select Features Enable Polling Update Device Devices Configured 	Branch1-LA.dcloud.cisco.com Branch2-NY.dcloud.cisco.com	CEF, NBAR, QOS, IP SLA, Flows, COLLECTOR, 30 CEF, NBAR, QOS, IP SLA, Flows, COLLECTOR, 30
	< Back Next > Finish	Cancel Help
		Cancel Help

Now that you have added three devices to the topology, they should look familiar to the image below. What is important to remember is that you should only bring in interfaces that will have interesting traffic, to you, traversing them. We will not need all the interfaces that have been included, so in one of the next Labs we'll remove the unneeded interfaces.

Lab A.3: Export/Import Device Configuration

Lab Steps:

44. From the File Menu select Export Devices.

L 19	8.18.13	3 3. 34 - F	Remot	e Desk	top (
A Li	veActio	on - loca	alhost						
File	View	Users	QoS	Flow	Rou				
	Add De	vice							
	Discover Devices								
	Import Devices								
	Export	Dectes							
	Manag	e Devices	5						
	Refres	h Devices	5						
Remove Network Objects									
	Exit								

45. Deselect **GigabitEthernet2** and Loopback0 from the 198.19.1.1 and 198.19.2.1 devices.

												Type here to filter result	
dd/Up	Name	Туре	Device Serial	IP Address	Vendor	Model	IOS Version	Description	Line Rate (Kb	Node	Site	Site CIDR	Data Cen
\checkmark	Branch1-LA.dcloud.cisco.c	Router	101	198.19.1.1	Cisco	ciscoCSR1000v	16.3.2	Cisco IOS Software [Denali],		Local	LA	10.0.1.1, 198.19.1	
\checkmark	GigabitEthernet1	Interface		198.19.1.1				Branch1 LAN	1,000,000	1			
	··· GigabitEthernet2	Interface		100.64.1.2				Internet	2,000	1			
\checkmark	··· GigabitEthernet3	Interface		10.255.1.2				MPLS	1,000				
	Loopback0	Interface		10.0.1.1					8,000,000				
	··· NullO	Interface							10,000,000	1			
	VoIP-Null0	Interface							10,000,000	1			
\checkmark	HQ-B1.dcloud.cisco.com	Router	2	198.18.129.24	Cisco	ciscoCSR1000v	16.3.2	Cisco IOS Software [Denali],		Local	HQ		
\checkmark	- GigabitEthernet1	Interface		198.18.129.24				HQ-LAN	1,000,000	1			
\checkmark	- GigabitEthernet2	Interface		100.64.0.2				Internet	1,000,000	1			
	- Loopback0	Interface							8,000,000	1			
	··· NullO	Interface							10,000,000	1			
	VoIP-Null0	Interface							10,000,000	1			
\checkmark	HQ-B2.dcloud.cisco.com	Router	3	198.18.129.25	Cisco	ciscoCSR1000v	16.3.2	Cisco IOS Software [Denali],		Local	HQ		
\checkmark	- GigabitEthernet1	Interface		198.18.129.25					1,000,000	1			
\checkmark	- GigabitEthernet2	Interface		10.255.0.2					1,000,000	1			
	- Loopback0	Interface		10.0.0.102					8,000,000	1			
	··· NullO	Interface							10,000,000	1			
	VoIP-Null0	Interface							10,000,000	1			
\checkmark	HQ-MC.dcloud.cisco.com	Router	1	198.18.129.23	Cisco	ciscoCSR1000v	16.3.2	Cisco IOS Software [Denali],		Local	HQ		
\checkmark	- GigabitEthernet1	Interface		198.18.129.23					1,000,000	1			
	- Loopback0	Interface		10.0.0.103					8,000,000	1			
	NullO	Interface							10,000,000	1			
	VoIP-Null0	Interface							10,000,000	1			
					<								

46. Select Export to csv.

- 47. On the Export window give the file a name.
- 48. Export the csv to the desktop, or appropriate directory.

A Export the co	ntent to a CSV	file				×
Look in	: 📃 Desktop		•	1 📂 🛙		
Recent Items Desktop My Documents	Administra Administra Computer Network LiveAction					
	, File name:	updateinterface.csv			\mathbb{R}	Export
Network	Files of type:	CSV files (*.csv)		Ŧ	Ľ	Cancel

- 49. Close the export devices window.
- 50. Select File and Import Devices.



51. Select the file you previously exported.

1	🚺 Import from a	1CS¥ file					×
	Look in:	🧮 Desktop			•) 📂 🖪	⊡ -
2	Recent Items Desktop My Documents Computer	Computer Administra Computer Network LiveAction	Upgrade				
		File name:	updateinterfa	ice.csv			Import
	Network	Files of type:	CSV files (*.c	sv)		Ŧ	Cancel

52. Click Add/Update Devices.

Denec	is selected for Add/Update will be	u ro hebbe e	hetebou								Q-			
d/Upd		Туре	Device Serial	IP Address	Vendor	Model	IOS Version	Description	Line Rate (K	Node	Site	Site CIDR	Data Ce	
\checkmark	Branch1-LA.dcloud.cisco	Router	101	198.19.1.1	Cisco	ciscoCSR1000v	16.3.2	Cisco IOS Software [Denali],		Local	LA	10.0.1.1, 198.1	Г	
	- GigabitEthernet1	Interface		198.19.1.1				Branch1 LAN	1,000,000				_	
	GigabitEthernet2	Interface		100.64.1.2				Internet	2,000					
	GigabitEthernet3	Interface		10.255.1.2				MPLS	1,000					
	Loopback0	Interface		10.0.1.1					8,000,000					
	NullO	Interface							10,000,000					
	VoIP-Null0	Interface							10,000,000					
	HQ-B1.dcloud.cisco.com	Router	2	198.18.129.24	Cisco	ciscoCSR1000v	16.3.2	Cisco IOS Software [Denali],		Local	HQ		Г	
	GigabitEthernet1	Interface		198.18.129.24				HQ-LAN	1,000,000				_	
	GigabitEthernet2	Interface		100.64.0.2				Internet	1,000,000					
	Loopback0	Interface							8,000,000					
Π	NullO	Interface							10,000,000					
Π	VoIP-Null0	Interface							10,000,000					
	HQ-B2.dcloud.cisco.com	Router	3	198.18.129.25	Cisco	ciscoCSR1000v	16.3.2	Cisco IOS Software [Denali],		Local	но			
	- GigabitEthernet1	Interface		198.18.129.25					1,000,000		-		_	
	GigabitEthernet2	Interface		10.255.0.2					1,000,000					
	Loopback0	Interface		10.0.0.102					8,000,000					
	NullO	Interface							10,000,000					
	VoIP-Null0	Interface							10,000,000					
	HQ-MC.dcloud.cisco.com	Router	1	198.18.129.23	Cisco	ciscoCSR1000v	16.3.2	Cisco IOS Software [Denali],		Local	HQ		Г	
	GigabitEthernet1	Interface		198.18.129.23					1,000,000				_	
	Loopback0	Interface		10.0.0.103					8,000,000					
	NullO	Interface							10,000,000					
	VoIP-Null0	Interface							10,000,000					
_														
					<									ł

53. Click OK to use the Default SNMP settings.

Δ		×
Node	Local	
Ouse the Default SNM	P connection settings	Edit
C Enter SNMP connecti	on settings for this device	
SNMP Version	Version 2c 💌	Target Port 161
Community String		
		Ok Cancel

Your Topology Pane will now show the appropriate devices/configurations.

Lab A.4: Saving Server Configurations

Prior to upgrading the LiveAction Software, or to retain existing Server configuration for use in the case of a hardware failure or misconfiguration, the current configuration file may be Exported to a local or network drive.

Lab Steps:

54. Open the LiveNX WebUI, select Settings.

	LiveAction ⁻											۰.	
Overv	Enter Filter Requ	est Here									Φ	Settings	
Sites	Devices, Interfaces by Stal	uses					Active Alerts						Settings Diagnostics
SI	ES: 2		DEVICES: 4		INTERFACES: 8		ALERTS						
•												LiveNX SI	lerver
5	TES 📴	0	DEVICES 🖸	0	INTERFACES 🗹	0							
•	HQ		Branch1-LA		GigabitEthernet1 Branch1-LA								
•	LA		 HQ-B1 		GigabitEthernet1(HQ-B1								
			HQ-B2		GigabitEthernet1(HQ-B2								
			 HQ-MC 		 GigabitEthernet1[HQ-MC GigabitEthernet2[Branch1-LA 								
					GigabitEthernet2(HQ-B1								
					GigabitEthernet2[HQ-B2								
					 GigabitEthernet3(Branch1-LA 			No Active	Alerts				

55. Select Configuration.

	_
≡ LiveActi	ion` ××
Settings	
Q Search	
Configuration	
Data Source Managemen	nt
Data Store Device Entity Page Repor	rts.
Email Configuration	
Integrations	~
Licensing	^
License Configuration	
License Expiration Noti	ification
LiveNA Configuration	
Mounted Data	
Nodes	
Properties	~
Proxy	
Reports	~
Security	~
Single Sign On	
SNMP Trap	
Syslog	
Troubleshooting	~
Updates	
Web UI Data Store	

- 56. Click Export.
- 57. Enter encryption password if preferred.



58. Select an appropriate place to save the file, give the file a name, then click Save.

Lab A.5: Connect via Remote Desktop Connection

A direct connection from the LiveNX Client installed on your workstation is the most efficient method to connect, but you may use RDC as an *alternate* way to connect to your Student Pod. SKIP this Lab if directly connecting with the LiveNX Client on your local workstation.

To connect using Microsoft Remote Desktop on Windows, or a compatible Remote Desktop client on Linux and Macintosh, follow the steps below. On Windows you can typically find Remote Desktop in START > ALL PROGRAMS > ACCESSORIES.

Note: Use the information from the Lab Details table to connect to the desired device.

Lab Steps:

Connect to the virtual Windows Workstation Desktop using the IP Address, username, and password pre-printed on the Class Worksheet, unless otherwise instructed.

- 59. Launch a Remote Desktop Connection.
- 60. BEFORE selecting Connect, click the General tab. (On Macintosh this will be the Preferences menu and Login tab.)

DIAGRAM



- a. Enter the following fields:
 •Computer: <ipaddress> :20201
 (From your Lab Access worksheet)
 •Username: administrator (or otherwise defined by instructor)
- 61. Set the RDC session properties on the Display tab so that your video is a minimum of 1200x800 resolution... this may NOT be changed once the connection is active. See next page for example.

DIAGRAM

퉣 Remote	e Deskt	op Connection		_		×
		note Desk nnectio				
General [Display	Local Resources	Experience	Advanced		
Display co	onfigura	tion				
	Choos	e the size of your re the right to use the		. Drag the sl	ider all th	e
	Small	Full Scree	n	_		
	Us	e all my monitors for	the remote se	ession		
Colors		e the color depth of est Quality (32 bit)	f the remote se	ession.		
🗹 Display t	the con	nection bar when I u	use the full scr	reen		
Alide Op	otions			Connect	He	elp

- 62. Select Connect.
- 63. Enter the workstation password: C1sco12345 (or otherwise defined by instructor).

DIAGRAM
Windows Security
Enter your credentials These credentials will be used to connect to vm.opnet.com.
DESKTOP-69VEDIF\administrator
Use another account
🕅 Remember my credentials
ОК Саде

64. Click OK.

Once successfully connected to your Pod you will see the Windows Desktop, and be able to access the LiveNX Server, Client, and other pod resources.

Note: Occasionally Remote Desktop may freeze its connection to the Pod workstation. If this happens, close the Remote Desktop window, and start again at Step 1 above. This will continue your lab session and will generally not lose any work.