

WanLink Queue Discipline

Goal: Setup a WanLink with an alternate queue discipline.

In this test scenario, the default WanLink queue discipline of FIFO (First In First Out) is replaced with WRR (Weighted Round Robin) to demonstrate how to setup queuing that will prioritize traffic flows based on IP ToS.

Note: WRR can only be used with User Mode WanLinks.

- 1. Setup a WanLink connection.
 - A. Go to the WanLinks tab and select Create.

LANforge Manager Version(5.3.7)	N X
<u>C</u> ontrol <u>Reporting</u> <u>Tear-Off</u> <u>Info</u> <u>Plugins</u>	
Stop All Restart Manager Refresh HE	ELP
Layer-4 Generic Test Mgr Test Group Resource Mgr Event Log Alerts Port Mgr VAP Stations Messages Status Layer-3 L3 Endps VolP/RTP VolP/RTP Armageddon WanLinks Attenuators File-I	10
Rpt Timer: fast (1 s) V Go Test Manager all V Select All Start Switch Stop Clear	
Hide Stopped Display Create Modify Batch Modify Delete	
WanLinks for Selected Test Manager	_
Name EID K-M State Endpoints (A ↔ B) PKt Tx A → B PKt Tx A ← B Bps Rx B Bps Rx A Rpt Tir	ner
All WanLink Endpoints	
WPs Name Run Script Max Rate Tx Pkts Rx Pkts Tx Rate Tx Drop % Dropped Tx-Failed Failed-Late TX Byte	es
	•
Logged in to: localhost:4002 as: Admin	

B. Enter the WanLink name, physical ports, base transfer rate, delay, jitter etc... These impairments will be applied to all traffic on the WanLink.

0	100Mbps-wan - Cr	ea	te/Modify WanLink			\odot \land \times			
+ - All	<u>Apply</u>	<	Display WanLink & WanPaths Cancel						
Name: Presets:									
	Endpoint A		Endpoint B						
Port:	2 (eth2)	•	3 (eth3)	-					
Transfer Rate:	100M (100 Mbps)	•	100M (100 Mbps)	•					
Delay:	tiny (10 ms)	•	tiny (10 ms)	-					
Drop-Freq:	zero (0%)	•	zero (0%)	-					
Jitter:	zero (O us)	•	zero (O us)	-					
Jitter-Freq:	zero (0%)	•	zero (0%)	-					

C. Select **Apply** to create the base WanLink.

For more information see LANforge-GUI User Guide: Creating & Modifying WanLinks

2. Setup WanLink for **User Mode**.

A. Select **All** to un-hide the other WanLink config panels.

													-	
0			100Mbps-w	an - (Create	e/Modify W	anLink						C) (~) (*
+ - All							<u>A</u> pply	<u>0</u> K		Display V	VanLink & Wa	nPaths	<u>C</u>	ancel
Name:	WanLink Information					2	Wa	anLink Inf	orma	tion	HW Pass	-Through		ŕ
Presets:	CUSTOM			_			Coupled-Mode				lode			
	Endpoint A		Endpoint B			Besource: 1 (jetwav-f24)						-		
Port:	2 (eth2)	2 (eth2)				Rpt Timer:		et (1 c)				-	
Transfer Rate:	100M (100 Mbps)			-	i l				,				•	
Delay:	tiny (10 ms)			-		Reorder-Fred	. zei	no (0%)			zero (0%)		-	
Drop-Freq:	zero (0%)			-		Dup-Freg:	zei	no (0%)			zero (O%)		-	
Jitter:	zero (0 us)	-	zero (O us)	-		Drop Burst	min	1	max	1	min 1	max 1		
Jitter-Freq:	zero (0%)	-	zero (0%)	•				-	1	-				
				Reorder Amt	min	1	max	20		20				
								S	cript		<u> </u>	cript		
	Endpoint	ΔW	AN Paths						Endp	oint B WAI	V Paths			<u> </u>
Cre	ate-WP Mo	dify-	WP Dele	te-WP		Cre	eate-WP		- The p	Modify-W	P	Delete	WP	
Name	Tx Rate Disabled !		Filter Pattern	0	Delay	Name	Tx Rate	e Disab	led	!	Filter Patte	rn	De	ay
					É									^
														=
						,								-
Л	WanLink Information						WanLir	k Inform	ation					
CPU-ID:	0			-	Test	Manager:	defau	lt_tm					-	
	Endpoint A		Endpoint B				Endpoir	nt A		En	dpoint B			
	🗌 ICEcap Replay	ICEcap Replay ICEcap Replay ICEcap Replay					🗌 Dum	p Packet	s		Dump Packet	s		
Replay File:					Dum	p File:								
	Dir		Dir				E Forc	e Packet	Gap		Force Packet	Gap		
	Loop Replay		✓ Loop Replay				Drop	-Xth			Drop-Xth			
							Reorder-Xth Reorder-Xth						-	

B. In panel 2, un-check the **Kernel-Mode** box.

0			100Mbps-w	an - C	Creat	e/Modify Wa	nLink						♪ ×
+ - All							Apply	<u>0</u> K	Display V	VanLink & War	Paths	<u>C</u> ano	el :
Name: Presets:	WanLink Information 100Mbps-wan CUSTOM			.		2	Wanl	ink Inform ass-Throu oupled-Mo	nation Igh ode	HW Pass-	Through		
	Endpoint A	Endpoint B Resource: 1 (jetvay-f24)						-					
Port:	2 (eth2)					Rpt Timer:	fast	(1 s)				
Transfer Rate:	100M (100 Mbps)						Endo	hint A		Endpoint R			
Delay:	tiny (10 ms)	-	tiny (10 ms)	-		Reorder-Frea:	zero	(0%)		zero (0%)		-	
Drop-Freq:	zero (0%)	-	zero (0%)	-		Dup-Frea:	zero	(0%)	-	zero (0%)		-	
Jitter:	zero (O us)	-	zero (O us)	-		Drop Burst	min 1		ax 1	min 1	1		
Jitter-Freq:	zero (0%)	-	zero (0%)	-							20		
						Reorder Amt:	min 1	m	ax 20		max 20		
								Scrip	ot	S	cript		
0	Endpoin	t A W	AN Paths					End	point B WAN	V Paths			
Cre	ate-WP M	odify-	WP Dele	te-WP		Crea	ate-WP		Modify-Wi	P	Delete-V	/P	
Name	Tx Rate Disabled !		Filter Pattern	D	elay	▲ Name	Tx Rate	Disabled	!	Filter Patter	n	Delay	^
						■							-
Д	WanLink Information						WanLink I	nformatio	n				
CRU-ID:	0			-	Tes	t Manager:	default_t	m			-		
	Endpoint A		Endpoint B			E	Endpoint	4	End	dpoint B			
	ICEcap Replay ICEcap Replay					na Tile	Dump F	ackets		Dump Packets	1		
Replay File:		-		-	Dur	np File:	Eorce P	acket Ga		Force Packet (Gan		
	Dir		Dir				Drop-Xt	h		Drop-Xth	oap		
	Loop Replay		✓ Loop Replay				Reorde	r-Xth		Reorder-Xth			-

C. Select **Apply** to change the WanLink.

For more information see LANforge-GUI User Guide: Creating & Modifying WanLinks

- 3. Demonstrate the FIFO Queue Discipline.
 - A. Start the WanLink, then run traffic through LANforge-ICE ports eth2 and eth3.

Here we are using LANforge-FIRE on a secondary resource to over-subscribe the 100Mbps WanLink with five 30Mbps traffic flows each with a different IP ToS value set to show that the FIFO WanLink ignores the ToS bits by treating all packets equally and processing them in the order they enter the queue.

0			LA	Nforge Ma	nager Version	(5.3.7)			\checkmark \land \times				
Control Reporting	Tear-0	ff <u>I</u> nfo <u>P</u> lu	igins										
					Stop All	Restart M	1anager	Refresh	HELP				
Layer-4 Generic Status Laye	Layer-4 Generic Test Mgr Test Group Resource Mgr Event Log Alerts Port Mgr VAP Stations Messages Status Layer-3 L3 Endps VolP/RTP VolP/RTP Endps Armageddon WanLinks Attenuators File-IO												
Rpt Time	Rpt Timer: fast (1 s) ▼ Go Test Manager all ▼ Select All Start Stop Quiesce Clear												
View 0 - 500 Go Display Create Modify Delete													
Cross Connects for Selected Test Manager													
Name	Cross Connects for Selected Test Manager Name Type State Pkt Rx A Pkt Rx B Bps Rx A Bps Rx B Rx Drop % A Rx Drop % B Drop Pkts A Drop -001-ToS-0 LF/UDP Stopped 0												
udp-001-ToS-0	LF/UDP	Stopped	0	0	0		0 0	0	0				
udp-002-ToS-64	LF/UDP	Stopped	0	0	0		0 0	0	0				
udp-003-ToS-96	LF/UDP	Stopped	0	0	0		0 0	0	0				
udp-004-ToS-128	LF/UDP	Stopped	0	0	0		0 0	0	0				
udp-005-ToS-192	LF/UDP	Stopped	0	0	0		0 0	0	0				
									•				
Logged in to: loca	lhost:40	02 as: Adr	nin										

B. The dropped packet percentages show that even with a high value ToS, no priority is observed.

0			LA	Nforge Mai	nager Version(5.3.7)			\odot					
<u>Control</u> <u>Reporting</u>	<u>T</u> ear-0	ff <u>I</u> nfo <u>P</u> lu	igins											
	Stop All Restart Manager Refresh HELP													
Layer-4 Generic	Layer-4 Generic Test Mgr Test Group Resource Mgr Event Log Alerts Port Mgr VAP Stations Messages													
Status Laye	Status Layer-3 L3 Endps VolP/RTP VolP/RTP Endps Armageddon WanLinks Attenuators File-10													
Rpt Timer: fast (1 s) 🔻 Go Test Manager all 💌 Select All Start Stop Quiesce Clear														
View	View 0 - 500 View Go Display Create Modify Delete													
				Cross Conne	cts for Selected Te	st Manager								
Name	Name Type State Pkt Rx A Pkt Rx B Bps Rx A Bps Rx B Rx Drop % A Rx Drop % B Drop Pkts A Drop vdp.001_ToS_0 LE(UDP Rup 20.996 29.019 24.731.675 23.640.798 15.753 15.013 5.764													
udp-001-ToS-0	LF/UDP	Run	30,986	29,019	24,731,675	23,640,798	15.753	15.913	5,794					
udp-002-ToS-64	LF/UDP	Run	31,203	32,229	25,341,139	26,170,783	4.697	12.647	1,733					
udp-003-ToS-96	LF/UDP	Run	24,693	26,359	20,052,738	21,405,667	22.327	28.551	8,237	1				
udp-004-ToS-128	LF/UDP	Run	18,211	18,788	14,787,804	15,256,343	39.887	49.07	14,714	1				
udp-005-ToS-192	LF/UDP	Run	16,050	14,245	12,948,194	11,490,452	49.169	61.644	18,261	2				
	udp-005-ToS-192 [LF/UDP Run 16,050 14,245 12,948,194 11,490,452 49.169 61.644 18,261 2													
Logged in to: loca	ilhost:40	02 as: Adr	nin											

- 4. Change the WanLink queue discipline to WRR.
 - A. Select the **Stop All** button to stop all connections, then **Modify** the WanLink.

•	LANforge Man	ager Version(5.3	3.7)			
<u>Control</u> <u>Reporting</u> <u>Tear-Off</u> <u>Info</u> <u>Plugir</u>	าร					
		Stop All	Restart Man	ager	Refresh	HELP
Layer-4 Generic Test Mgr Test Gr Status Layer-3 L3 Endps	oup Resource Mgr VolP/RTP VolP	Event Log Alerts /RTP Endps Ar	Port Mgr VAP mageddon	Stations Mes WanLinks	sages Attenuators	File-I0
Rpt Timer: fast (1 s) 💌 (Go Test Manager all	-	Select All St	art Switch	<u>S</u> top Clear	
	Hide Stopped	Dis	splay Cr <u>e</u> ate	Mo <u>d</u> ify <u>B</u> ato	h Modify De	lete
		for Selected Test Mar	nager			
Name EID K-M State	Endpoints (A ↔ B)	Pkt Tx A \rightarrow B F	Pkt Tx A ← B	Bps Rx B	Bps Rx A	Rpt Timer
100Mbps-wan 6.32 Stopped	100Mbps-wan-A <	1,652,866	1,652,224	100,000,000	100,000,000	1,000
	All	WanLink Endpoints -	1 1	1		
WPs Name Run Script M	lax Rate Tx Pkts	Rx Pkts Tx Rate	Tx Drop % Dr	opped Tx-Faile	ed Failed-Late	TX Bytes
+ 100Mbps-w None 100	0,000,000 1,652,224	2,542,720,98,956,507	35.085 8	389,687	0 0	2,501,42
	1,000,000 1,052,800 .	2,039,970,98,903,204	35,062 8	387,392	0 0	2,502,38
						•
Logged in to: localhost:4002 as: Admin						

B. In panel 4, change the **QDisc** field to the following string:

WRR,2000-0-255,4000-64-255,8000-96-255,16000-128-255,32000-192-255 for both Endpoint-A and Endpoint-B. The WRR string format is weight-ToS-mask where higher weights are given higher priority to packets matching the ToS and bit mask.

Note: Minimum weighting should be equal to or greater than your MTU.

		100Mbps-wan - O	Create/Modify W	anLink	\odot \odot \otimes
+ - All				Apply OK Displa	ay WanLink & WanPaths <u>C</u> ancel
0	Endpoint A W	AN Paths	JU.	Endpoint B	WAN Paths
Cre	eate-WP Modify	WP Delete-WP	Cre	eate-WP Modif	y-WP Delete-WP
Name	Tx Rate Disabled !	Filter Pattern D	elay Name	Tx Rate Disabled !	Filter Pattern Delay
Л	WanLink Information			WanLink Information	
CRU-ID:	0	-	Test Manager:	default_tm	•
	Endpoint A	Endpoint B		Endpoint A	Endpoint B
	🗌 ICEcap Replay	ICEcap Replay		Dump Packets	Dump Packets
Replay File:	•	-	Dump File:		
	Dir	Dir		Force Packet Gap	Force Packet Gap
	Loop Replay	✓ Loop Replay		Drop-Xth	Drop-Xth
	🖌 Replay Latency	🖌 Replay Latency	[Reorder-Xth	Reorder-Xth
	🖌 Replay Loss	🖌 Replay Loss	QDisc:	WRR,2000-0-255,4000-64-	WRR,2000-0-255,4000-64-
	🗹 Replay Dup	🖌 Replay Dup	Max Lateness:	AUTO	AUTO
	P Replay Bandwidth	🕑 Replay Bandwidth	Backlog Buffer:	AUTO	AUTO 🔽
Corruption: 1	Endpoint A	Endpoint B	Corruption: 4	Endpoint A	Endpoint B
Rate:	0	0	Rate:	0	0
Corruption:	Random Write 🔻	Random Write 💌	Corruption:	Random Write	▼ Random Write ▼
Byte-to-Write:	0	0	Byte-to-Write	0	0
Range Offset	min 0 max 0	min 0 max 0	Range Offset	min 0 max 0	min 0 max 0
	Chain-to-Next	Chain-to-Next		Chain-to-Next	Chain-to-Next
	🗌 Do Checksum	🗌 Do Checksum		Do Checksum	Do Checksum
Corruption: 2	Endpoint A	Endpoint B	Corruption: 5	Endpoint A	Endpoint B

C. Select **OK** to apply changes to the WanLink and close the modify window.

For more information see LANforge-GUI User Guide: Creating & Modifying WanLinks

- 5. Demonstrate the WRR Queue Discipline.
 - A. Run the WanLink and the same five UDP traffic flows through LANforge-ICE ports eth2 and eth3.

				L	ANforge Mai	nager Ve	ersion(5.3	3.7)				
<u>Control</u> <u>R</u> e	porting	Tear	-Off <u>I</u> nfo <u>P</u>	lugins								
						Sto	p All	Restart I	Manager		Refresh	HELP
Layer-4 Status	Generic Laye	Tes r-3	st Mgr Tes L3 Endps	st Group R VolP/F	esource Mgr	Event Log P/RTP Endps	Alerts	Port Mgr mageddon	vAP Stations WanLink	s Messa (s A	iges ttenuators	File-I0
Rpt 1	Timer: f	ast	(1 s)	✓ Go Test	Manager all	-		Select All	Start S	witch <u>S</u>	top Clear	
				🗌 Hide S	Stopped		Dis	splay Cr <u>e</u> at	e Mo <u>d</u> ify	<u>B</u> atch	Modify De	lete
						for Selecte	d Test Mar	nager				
Name	e l	EID K	C-M Sta	te End	points (A ↔ B)	Pkt Tx A	→B F	°kt Tx A ← B	Bps Rx	В	Bps Rx A	Rpt Timer
100Mbps-w	van 6	.32 [Run	100M	bps-wan-A <		0	0	100,00	0,000	100,000,000	1,000
					———Al	l WanLink E	ndpoints-					
WPs	Name	Run	Script	Max Rate	Tx Pkts	Rx Pkts	Tx Rate	Tx Drop %	Dropped	Tx-Failed	Failed-Late	TX Bytes
+ 100	Mbps-w		None	100,000,00	0 0	0	0	0 0	0		0 0	0
+ 100	Mbps-w		None	100,000,00	0 0	0	(0 0	0		0 0	0
												•
Logged in t	to: local	host:4	4002 as: Ao	dmin								

B. This time, the higher valued ToS UDP flows are experiencing less drops due to the WRR priorities setup in the WanLink.

0			LA	Nforge Mai	nager Version(5.3.7)			\odot				
<u>Control</u> <u>R</u> eporting	<u>T</u> ear-0	ff <u>I</u> nfo <u>P</u> lu	igins										
					Stop All	Restart Mai	nager	Re	fresh	HELP			
Layer-4 Generic Test Mgr Test Group Resource Mgr Event Log Alerts Port Mgr VAP Stations Messages Status Layer-3 L3 Endps VolP/RTP VolP/RTP Armageddon WanLinks Attenuators File-IO													
Rpt Timer: fast (1 s) ▼ Go Test Manager all ▼ Select All Start Stop Quiesce Clear													
View 0 - 500 Go Display Create Modify Delete													
[Cross Conne	ects for Selected Te	st Manager							
Name	Name Type State Pkt Rx A Pkt Rx B Bps Rx A Bps Rx B Rx Drop % A Rx Drop % B Drop Pkts A Drop 0.001 ToS 0 1.64 UPP Fund 5.765 3.705 6.762 717 4.321 919 66.044 94.412 17.056 5.765												
udp-001-ToS-0	LF/UDP	Run	5,785	3,705	6,763,717	4,331,818	66.944	84.413	17,056	2			
udp-002-ToS-64	LF/UDP	Run	38,161	41,833	13,897,326	15,332,256	52.24	43.04	41,741	3			
udp-003-ToS-96	LF/UDP	Run	43,067	34,538	15,736,044	12,619,674	44.292	53.409	36,468	3			
udp-004-ToS-128	LF/UDP	Run	80,270	62,238	25,151,921	19,501,747	10.9	28.267	10,152	2			
udp-005-ToS-192	LF/UDP	Run	104,400	77,234	32,449,505	24,003,895	0	15.729	0	1			
	Inder 103-126 Inder 101 101 101 101 101 101 101 101 101 10												
•										•			
Logged in to: loca	lhost:40	02 as: Adr	nin										

For more information see LANforge-GUI User Guide: Layer-3 Cross-Connects

Candela Technologies, Inc., 2417 Main Street, Suite 201, Ferndale, WA 98248, USA www.candelatech.com | sales@candelatech.com | +1.360.380.1618