

Inspired Innovation

Spirent TestCenter 组播测试例





### 1. IPTV (v6) 测试拓扑



## 2. 打开 STC GUI 界面



## 3. 选择协议

在协议选择界面选择 IGMP 协议。

hnology	Δ	-
BGP Signaled VPLS		
LDP Signaled VPLS		
MPLS IP VPN (RFC 2547)		
RSVP-TE		
Multicast VPN		
BFD		
Access		
ANCP		
PPPoX		
		-

## 4. 占用 STC 测试端口

点击端口占用,选择需要连接的机框并占用端口。如果使用以前占用过的端口可以直接用快捷 方式占用。



onnection Name	Model	Status	ľ
- Port 10 Port 11 Port 12 → Slot 2 Port 1	HYPERMETRICS CM 10/100/1	Reserved by support@GS1LAB Reserved by DLiang@DLiang-XP Reserved by DLiang@DLiang-XP To Be Reserved	
Port 2		To Be Reserved	ľ
Port 3 Port 4 Port 5 Port 6 Port 7 Port 8 Port 9 Port 9 Port 10 Port 11 Port 12 Port 12 Port 1	8 PORT 1G Fiber SFP Rev B\F	Available Available Test package 1417 is active. Ap Test package 1417 is active. Ap Test package 1417 is active. Ap Test package 1417 is active. Ap Available Available Available Available	
		Available Available Available	[
rmware Version: 3.30.4496			



## 5. 检查端口物理连接并确认正常

根据实际情况选择物理端口类型以及是否开启自协商。确认物理连接状态正常,状态灯指示为绿色证明物理连接状态正常。



## 6. 添加 Multicast Source/ client 节点

运行添	加节	占自	目骨。
	/JH 1º.	AND F	0 1 1 0

🚱 Untitled.tcc - Spirent TestCenter					
File Edit View Tools Actions Help	p				
🗋 🧉 🛃   🎇   🔏 🐚 🚵 🎇 Chassis 🖲	- 🔠 Apply 🛛 🚓 👌		B B 🐝 9	🚡 🔐 📔 Те	chnolog
Test Configuration					
All Devices (Hosts, Routers,)	Filter by device	elete 🔧 Crea role: 👝 All	te Links	🔪 Filter 🧏 Edi 🔁 Hosts 🛛 😝	t Links. Rout
All Traffic Concenters	Emulated Device	e Interface	GMP/MLD	PTV ]	
All Traffic Generators	Port Name	Device Name	Device Count	Role	Inc Lir
Ports     Port //2/1				-	+
Traffic Generator		3			-
		2			

选择组播源和客户端端口,点击下一步。



这里我们之需要先添加节点,IGMP 协议可以添加完节点后在添加,因此选择 None 点击下一步。

Steps	Select Protocols				
Select Ports	Select the protocols to enable on the devices Application protocols (e.g. HTTP, FTP, SIP and Video) a	are configure	d through	the Applica	ation Layer Wi
Select Protocols					<u></u>
Select Encapsulation	Protocol Technologies				
Configure Devices	None (Traffic only device) Access Routing a	ind MPLS	Switch	iing	
			The second	ine Core	orted
Preview	Protocol		IP Vers	ions Supp	

## 选择 IPV4,如果有 Vlan 可以点击添加 Vlan。

teps	Select Encapsulation	
Select Ports	Select encapsulation	
Select Protocols		
Select Encapsulation	Upper Layer	
Configure Devices	C None	
Preview	● © IPv4	
	Cinc	
	C IPv4 and IPv6 (dual stack)	
	M Ethemet	
	PPP/Cisco HDLC GRE over IPv4	

选择节点角色为 host,这步设置是可选项,保持默认值 None 并不影响测试。

#### **Configure Devices**

Configure device options

Devices per port:	1		Total
Device blocks per port:	1		Total devic
Device block mode:	One network per block, m	ultiple devices per network	
Device role:	<none></none>	Name: Device \$(BlockIndex)	
Ethernet	<none> Host</none>		
Enable RFC 4814	MAC addresses Rand	om Seed: 4814 🚔	
MAC address: 00:10	0:94:00:00:01 Step:	per device=00:00:00:00:00:01	

设置 Mac 地址,初始值可以任意配置,因我们同时配置两个端口的值,因此需要加上基于端口的步长值,以保证两个端口的 MAC 地址不同。

1AC address: 00:10:94:00:00:01	Start value 2 00:10:94:00:00:01	1-
v4 IPv4 address: 192.85.1.3	Step per device: 00:00:00:00:00	
Prefix length: 24 IPv4 gateway: 192.85.1.1	Determines the next value when stepping across ports. If no step is provided, the value will continue from where it left off. To repeat across ports, set the step per port to zero.	
ToS/DiffServ (hex): C0	Step per Port: 00:00:00:00:00	

设置 IPv4 地址,初始值根据实际需求配置,配置端口步长。以下配置示例配置了第一个端口的 IPv4 地址 72.0.1.2,第二个端口的 IPv6 地址是 72.0.2.2。

IPv4 address:	72.0.1.1	Step: per device=0.0.0.1, per port=1.0.0.0	
Prefix length:	24	Address Step	
IPv4 gateway:	72.0.1.1	Start value 2 72.0.1.2	
ToS/DiffServ (h	ex): C0	Step per device: 0.0.0.1	
		Port Step	
		Determines the next value when stepping across ports.     If no step is provided, the value will continue from where it left off.     To repeat across ports, set the step per port to zero.	
		☑ Step per P3 → [0.0.1.0	
		4 DK Cancel	

点击下一步可以预览添加的节点情况,如果没有问题可以点击结束按钮完成节点的添加。

Steps	Preview	ow of the devices that u	ill be erected				
Select Ports	Flevi	ew of the devices that v	in be created				
Select Protocols Select Encapsulation	1 84 4 P	age 1 of 1	Þ Þ4	Preview mode: Full	•	Options Page Filter	
Configure Devices	Drag a col	umn header here to gro	up by that column.				
Preview	No	Port	Name	EthIIIf1 StoMac	Inv/IIf1 Addr	Invillf1 Gateway	
	1	Port //2/1	Host 1	00:10:94:00:00:01	72.0.1.2	72.0.1.1	
	2	Port //2/2	Host 2	00:10:94:00:00:02	72.0.2.2	72.0.2.1	

1

单击 Device Name 可以修改节点名称,建议根据拓扑修改名称,这样可以很容易的区分节点的角色。

Whited.tcc - Spirent TestCenter			
File     Edit     View     Tools     Actions     Help       Image: Comparison of the second s	•   🎦 Apply   🚓	8 8 8 8 8 <b>4</b> 4	🚡 🔐   🚺 Ted
Test Configuration			
All Devices (Hosts, Routers,)	Filter by device	elete 💊 Create Links 😡 role: 🔜 All Devices e Interface IGMP/MLD	Hosts
All Traffic Generators	Port Name	Device Name	Device Count
All Stream Blocks	> Port 20	Source	1
Ports	Port //2/2	Clients	1
Port //2/1			

## 7. 组播组和组播流量配置

选择组播接收节点,使能组	潘协	议。						
Untitled.tcc - Spirent TestCenter								
File Edit View Tools Actions He	lp +   🎦	Apply 🛛 🎆	8 <b>F</b> F F F	<ul> <li></li> <li><th>Technologies</th><th>Perspect</th><th>ive 🔻 🛛 🏭 Sec</th><th>quencer</th></li></ul>	Technologies	Perspect	ive 🔻 🛛 🏭 Sec	quencer
Test Configuration		Add 🗙 De	elete 📏 Create Link	s 🔾 Filter 🦞	Edit Links	Edit Interface.		🗟 Edit
All External Devices All Ports All Ports All Devices (Hosts, Routers,)	F	ilter by device mulated Devic	role: All Device	ILD	Routers			-14
All Traffic Generators		Port Name	Device Name	Active	Multicast Version	Group Count	Source Count	Cal
All Stream Blocks	Þ	Port //2/2	Clients	3-▶ ☑	IGMPv2	0		
Port //2/1							_	
Traffic Generator						3		
Ort //2/2     Devices								1 25
Traffic Generator								

根据测试需求选择组播协议版本,这里我们选择常用的 IGMPv2,点击编辑组播组按钮。

F	, Add 🗙 De ilter by device	elete 🔧 Create Links [ role: 🔜 All Devices [	Filter % E E Hosts	dit Links 🥻 Ed	lit Interface.	·· 2 🍑	👌 Edit Group M	lemberships	
E	mulated Devic	e Interface IGMP/MLD							
	Port Name	Device Name	Active	Multicast Version	Group Count	Source Count	Calculate Latency	Pack Reports	Force Single Initial Join
•	Port //2/2	Clients		IGMPv2 🔻	0				
1				IGMPv1					
1			1-	IGMPv2					
				IGMPv3					
					3				

点击 Add 添加这个节点要加入的组。如果之前没有添加过组,可以选择"A dd new groups", 设置组的起始地址,组地址的增量。设置组的数量可以通过设置"Number of group"值。 "Number of group blocks"指的是不同组的集合。

3.40版本新增了一个功能,就是"one-to-one"mapping,如果用户需要使 Device block 里的每 个节点和 Group block 里的组一一对应,使用"one-to-one"将会很方便。通常在测试需求中有多 个 host 节点,每个 host 节点需要加入不同的组,需要选择"one-to-one"。

	×
lete 📲 Manage Multicast Groups 🚵 Apply	
p Membership	×
Add New Groups	
ups Creates new multicast group(s) and maps these group(s) to the ase groups	sociated multicast host or router
Starting group a 3 ass     225.0.0.1       Group address increment:     0.0.0.1       Number of group     1       Number of group blocks:     1	
	Interstip   Add New Groups   groups   Group address increment:   0.0.1   Number of group blocks:   1

## 点击 ok 后可以看到节点加入了一个组,组地址是 225.0.0.1。

Edi	t Group Mem	berships						×
Se	ect Devices 💌	👍 Add 🗙	Delete 🖏	Manage Multicast	Groups 🔠	Apply		
ю	MP Group Me	mberships						
	Port Name	Device Name	Active	Multicast Group	Number of Groups	Starting Group IP	Device-Group Mapping	
•	Port //2/2	Clients		Ipv4Group 1	1	225.0.0.1	Many-to-many	
					-			

### 如果需要测试加入/离开时延,需要使能计算时延选项。

Emulated Device Interface IGMP/MLD

	Port Name	Device Name	Active	Multicast Version	Group Count	Source Count	Calculate Latency	Pack Reports	Force Single Initial Join	Force Robust Join	
•	Port //2/2	Clients		IGMPv2	1						1

在组播源端口配置组播流量。点击添加绑定流。

🐌 Untitled.tcc - Spirent TestCenter					
File Edit View Tools Actions Help	)				
🗋 😂 🛃 🗱 🗼 🗈 🎇 Chassis -	+ 🎦 Apply	<b>a</b> a F		🕻 🐔 🔐   🏢 т	echnologies
Test Configuration					
🖻 🗁 Spirent TestCenter	Add	Genera	te Stream Block	🗙 Delete 🛛 🔛 Edi	t 「闘 Copy
All External Devices	Add B	ound Stream	Block(s)		
All Ports	Add R	aw Stream B	llock		2.85
All Devices (Hosts, Routers,)	G Pr	ort based		В	urst size:
All Traffic Generators	0.1	ad per stre	amblack	T I	nter frame gap
All Stream Blocks	0.0	Jau per sue		Ir	nter frame gap
Ports	State	Active	Name	Index	Controlled
🖻 🥥 Port //2/1				0	
Devices	1				
Traffic Generator	1				
Traffic Analyzer		-			
Capture					
Devices			2	C	2
Traffic Generator				10	
Traffic Analyzer					
Capture		- 20-	8	0	
	10 10		12	2	- 22

选择组播源端口。组播接收端口不需要选择。

Traffic Wizard		
Select active po	rts	
Ports Endpoints Frame Size Frame Traffic Load	Select ports:	

选择组播源和目的,添加流量。注意组播流量是单向流量。

Traffic Wizard					x
Select source	network and destination network	¢		In	Spirent TestCenter
Ports Endpoints Frame Size Frame Traffic Load	Distribution Fully meshed Backbone Pair Filter Protocol: Device,Bfd,Rip,Lld Encapsulation: IPv4 Orientation Unidirectional Switch Src/Dest Endpoints Mapping	Source and Destinati Source: (1)	on Select Multiple (72.0.1.2/24) Add Re >Ipv4Group 1 (225.0.0	Destination: (1)	Select Multiple e (72.0.1.2/24) Froup 1 (225.0.0.1/32)

## 设置组播流的帧长度。

Setup general t	raffic configuration		Spirent TestCente	er M
Ports Endpoints Frame Size Frame Traffic Load	General Stream block name prefix: Frame Size (Bytes) (With CR	StreamBlock 1	Vary Protocol & QOS Configure Options	
Rx Port	<ul> <li>Fixed Size:</li> <li>Random Min:</li> <li>Increment Max:</li> <li>Decrement Step</li> <li>Auto</li> <li>iMIX Definition</li> </ul>	128 -	<ul> <li>Allow port to generate traffic to itself</li> <li>Expand stream blocks under ports</li> <li>Multiple paths per streamblock</li> <li>One path per streamblock</li> </ul>	

设置组播流量的 load。

Traffic Wizard				x
Setup genera	l traffic configuration			Spirent TestCenter
Ports Endpoints Frame Size Frame Rx Port	Generator Scheduling Mode Port based Load per streamblock	Rate Based 💌	Generator Load Options Load mode: Load unit: 2 Load:	Fixed  Percent (%)
	Settings Scheduling priority: (0 is the highest)	0	Min: Max:	

点击完成结束组播流的添加。

### 8. 被测设备参考配置

以 Cisco 路由器为例,参考配置如下:

ip multicast-routing ip pim rp-address 72.0.1.1

interface GigabitEthernet0/1 ip address 72.0.1.1 255.255.255.0 ip pim sparse-mode

interface GigabitEthernet0/2 ip address 72.0.2.1 255.255.255.0 ip pim sparse-mode

### 9. 手动测试并查看测试结果

开始发送组播流前,在节点上发送下 ARP,确认地址解析没有问题。

	Port Name	Device	Name		Device Count	Role	Incon	ning Links	Outgoing Links	Encapsulati	on
•	Port Right (	Click ce			1	Host				EthernetII/I	Pv4
	Port //2/2	Clients		≦ × ∦	Add Multiple Devi Delete Cut EmulatedDev	ices	Ctrl+X	_		EthernetII/I	Pv4
					Copy EmulatedDe	evice	Ctrl+C				
					Duplicate						
					Add Links		I	·	<u></u>		
		-		%	Edit Links					- 22	
•	▲		Edit Interface View Control Plane Bindings								
It.	change Dee	de View	1260		Stop Device			lad Chuorma	Desults   Char	nen Denult View	%G
	Undersize/Oversize/Jumbo   PF(			Start All Devices			Il Ports	Il Ports    Select Rx Ports: All Ports			
unt	Total Tx Cour	Total Tx Count (bits) Total		指	Stop All Devices						1
	0		30,18	-	ARP/ND Ping			Start A			uencing
	0 31,72			View Bindings			Start ARP/ND On All Devices X Tx ( Stop ARP/ND				

## 状态栏地址所有解析成功后,可以开始发送组播流量。

Basic Counters	Errors Trigger	rs Protocols Ur	ndersize/Oversize/Jumbo	PFC Counters	
Port Name	Total Tx Count (Frames)	Total Rx Count (Frames)	Total Tx Count (bits)	Total Rx Count (bits)	Total Tx Rate
Port //2/1	1	63	512	48,424	0
Port //2/2	1	68	512	50,984	0
		4			
		3			
				-	
					<u>•</u>

选择相应的流,点击 Start 发送组播流量。

All Stream Blocks			I	iter frame gap unit	🗴 bytes 💆
Ports     Port //2/1	Right Click	e Name	Index	Controlled By	Source
Devices 2		Add Bound Stream Block Add Raw Stream Block. Delete Cut StreamBlock Copy StreamBlock Paste Duplicate Edit	k(s) Ctrl+X Ctrl+C Ctrl+V	generator	Source (72.0.1.2/24)
asic Traffic:Results 1	3 🗫	Start			
ort Traffic and Counters > Basic Traffic Results Basic Counters   Errors   Triggers   Protocols   Un	s   Change   Change	Stop ARP/ND	•	Select Tx	s > Detailed Strear Ports: All Ports

## 这个时候查看端口或者流统计,接收端口没有流量。

Po	rt Traffic and	Counters > Basic Traf	fic Results   Change Re	sult View 👻 👔 🛛 🔍 🚽	1of1 👂 🕅	St	reams > Deta	ailed Stream Re	esults Char	nge Result View 👻	1121 104 4	1 of 1 🕞 📦	0
В	asic Counters	Errors Triggers Pro	tocols Undersize/Overs	size/Jumbo PFC Counters		Se	lect Tx Ports:	All Ports	-   Sele	ct Rx Ports: All P	orts -	Change Counter	Mode:
	Port Name	Generator Rate (Bps)	Generator Rate (bps)	Generator Sig Rate (fps)	Rx Sig Rate (fps)	Ba	asic Mode	-					
•	Port //2/1	10.810.825	86.486.600	84.460	0	E	Basic Counters	Errors Basic	Sequencing	Advanced Seque	encing Histogram	5	
	Port //2/2	0	0	0	0		Name/ID	Tx Port Name	Rx Port Names	Aggregated Rx Port Count	Tx Count (Frames)	Rx Count (Frames)	Tx Rate (bp
						▶	StreamBloc	Port //2/1	N/A	0	2,291,082	0	86,486,576
						-		<	-				
					-								
					-	-							
4		H	1			4		-		1			•

## 切换到 IGMP 结果窗口,选择相应的节点,点击加入。

Idlicast > IGMP > IGMP Result       Idlicast > IGMP > IGMP Result	S Change Result View - Create Dynamic/Query View	I lof 1	elect View   Change Result View 👻	
Port Name Device Mu Name Clients IGN	Create Table View Create Chart View Customize View Reset View Enable Views Select View Select Recent View	own Types Rx IGMP Check		
		Multicast	IGMP	IGMP Results
alidation Errors   Log - 71 messa	es   Basic Traffic:Results 1 Basic Traffic:Results	Switching External Device	MLD IGMP-MLD Group Results	IGMP Port Aggregated Results

选择 IGMP 组状态结果窗口,查看组加入的情况。

Name	Device Address	evice ddress Group Address S		State Cha	Create Table Vi Create Chart Vi	ew		estamp	Join Latency (ms		
					Customize View Reset View Enable Views						
		Port	Port Traffic and Counters		Select View		•				
	Streams Routing and N			Select Recent View			•				
			Multicast 🕨			•					
ts 2		Switc	Switching +		MLD •		IGMP Devic	e-Group Results			
		Exter	nal Device	•	IGMP-MLD Group Results			MIDD	MID Device-Group Results		

### 10. 测试结果报告

# 组播组加入后,查看接收端口是否有流量,是否有丢包。以及组播流量的转发时延。

Port Traffic and	Counters > Basic Traf	fic Results   Change Re	sult View 👻 👔 🛛 🖉 🖉	1 of 1 🚺 🚺	Str	reams > Det	ailed	Stream Results	Change Result View	- 1 🎦   144 🔌	1 of 1	Del
Basic Counters	Errors Triggers Pro	tocols Undersize/Overs	size/Jumbo PFC Counters	1	Sele	ect Tx Ports:	All Po	orts 🔹	Select Rx Ports: A	ll Ports	- Change Cou	unter Mode:
Port Name	Generator Rate (Bps)	Generator Rate (bps)	Generator Sig Rate (fps)	Rx Sig Rate (fps)	Int	er-arrival Time	Mc					
Port //2/1	10.810.821	86,486,568	84.460	0	Ba	asic Counters	Err	ors Basic Sequence	ing Advanced Se	quencing Histo	grams	
Port //2/2	0	0	0	84,460		Name/ID	)	Tx L1 Count (bits)	Tx L1 Rate (bps)	Tx Rate (fps)	Rx Rate (fps)	Rx Sig Count (Frames)
		-	-		►	StreamBloc.	?	57,112,552,352	100,000,042	84,460	84,459	6,896,522
						-	-					
											1	

Ψ×

## 组播加入/离开时延可以在 IGMP 组状态结果窗口得到。

M	lticast > I	GMP-MLD Gro	up Results > IGMP	Device-Group	Results   Change Result Vie	ew 🕶   🎦   🛯 🔹	1 of 1	🕅   Filter:	
No	Filter (All R	esult C 💌							
	Name	Device Address	Group Address	State	State Change Timestamp	Join Timestamp	Leave Timestamp	Join Latency (msec)	Leave
F	Clients	72.0.2.2	225.0.0.1	IDLE MEMBER	5Days-14:12:19.16090471	5Days-14:09:3	0Days-00:00:00	1.04186	0
•		1	1		1				•

### 注意离开时延需要在组离开后得到。

M	liticast > 1	IGMP-MLD Gro	oup Results > IGMP Device	e-Group Results	Change Result View	• 112 104 4	1 of 1 🕒 🕅 🛛 Filter	:	
140	Name	ate	State Change Timestamp	Join Timestamp	Leave Timestamp	Join Latency (msec)	Leave Latency (msec)	Join Failure (No Traffic)	Dup
•	Clients	ON MEMBER	5Days-14:14:22.75259013	5Days-14:09:3	5Days-14:14:22	1.04186	1,999.21258	•	
0							-		