

目 录

前言:	1
一、测试总结.....	1
二、测试用例.....	2
三、测试步骤.....	3
3.1 占用 Ports.....	3
3.2 配置 IP 地址.....	4
3.3 配置 RIPng.....	6
3.4 发布 RIPng Route.....	11
3.5 配置流量.....	13

前言：

在国际性网络中，如因特网，拥有很多应用于整个网络的路由选择协议。形成网络的每一个自治系统（AS），都有属于自己的路由选择技术，不同的自治系统，路由选择技术也不同。自治系统内部的路由选择协议称为内部网关协议（IGP）。外部网关协议（EGP）是一种用于在自治系统之间传输路由选择信息的协议。RIPng 在中等规模的 AS 中被用作 IGP 协议。对于较复杂的网络环境 RIPng 不适用。

RIPng 是一种距离向量（Distance Vector）算法。此协议所用的算法早在 1969 年，ARPANET 就用其来计算路由。然而该协议最初属于 XEROX 网络协议。PUP 协议通过网关信息协议交换路由选择信息，而 XNS 则采用该协议的更新版本，命名为路由选择信息协议（RIP）实现路由选择信息交换。Berkeley 的路由协议很大程度上与 RIP 相同，即能够处理 IPV4 及其它地址类型的通用地址格式取代了 XNS 地址，同时路由选择每隔 30 秒更新一次。正是因为这种相似性，RIP 既适用于 XNS 协议，也适用于路由类协议。通过先学习本文您将获得：

1. 全面了解 RIPng 协议原理；
2. 了解协议的内在运行机制；
3. 通过典型用例进行实操联系，加深对协议的理解；
4. 同时熟悉仪表的操作方式。

一、测试总结

本篇文章的实验思路如下所示：

1. 在 port 上创建接口，配置 IPV6 地址；
2. 配置向导中选择 RIPng 协议仿真；
3. 选择端口-配置 RIP 版本；
4. 配置 RIPng 路由；
5. 配置交换机：使能全局 RIPng 功能、配置接口 IPV6 地址、使能接口 RIPng 功能；

通过实现以上思路并进行配置，您将获得以下测试结果：

1. 仪表 RIPng 协议仿真状态为 Open；
2. 协议会话统计结果有报文收发；
3. 交换机 RIPng 邻居状态创建、RIPng 路由表接收仪表发来的 RIPng 路由；

实验结果说明：交换机 RIPng 邻居状态建立说明仪表和交换机之间的 RIPng 邻居关系已建立成功，交换机 RIPng 路由表有 IPV6 路由说明仪表成功发布了 RIPng 路由，由此验证了 RIPng 的协议会话和路由发布功能；

接下来为您演示使用信而泰网络测试仪配套测试软件“RENIX”进行基于 IPv6 的 RIPng 路由协议测试实操。

二、测试用例



测试目的

- 验证 DUT 基本的 RIPng 功能
- 验证 RIPng 路由的流量转发功能

测试说明

- 测试仪 P1 模拟 RIPng, 和 DUT 的 G0/0/9 之间建立 RIPng 邻居
- 测试仪的 P1 向 DUT 发送 5 条 Routes
- 测试仪端口 P2 向 5 条 Routes 发送流量, 验证是否能够正常转发

测试步骤

- 按图连接好拓扑
- 配置好测试仪和 DUT 的接口 IP 地址
- 在测试仪 P1 和 DUT 的 G0/0/9 之间配置 RIPng 邻居
- P1 端口向 DUT 发送 5 条 Routes(2003::1~2003:0:0:4::1/64)
- P2 向 5 条 Routes 发送 100M 的流量
- 在测试仪 P1 上启动 RIPng
- 在 DUT 上查看 RIPng 邻居是否建立
- 在 DUT 上查看是否学习到测试仪发送的 5 条 Routes
- 从测试仪端口 P2 向 5 条 Routes 发送 100M 的流量

预期结果

- RIPng 邻居能够正常建立
- DUT 能够学习到全部的 5 条 Routes
- 测试仪 P1 端口能够收到 P2 发送的流量，没有丢包

三、测试步骤

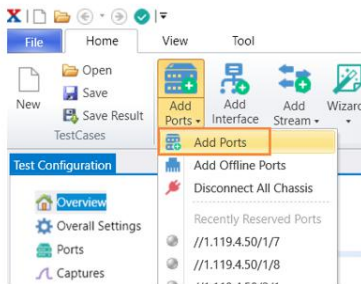
3.1 占用 Ports

步骤 1-1: 添加机框

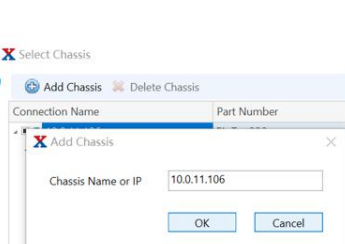
❖ 打开软件



❖ 添加端口



❖ 输入IP地址



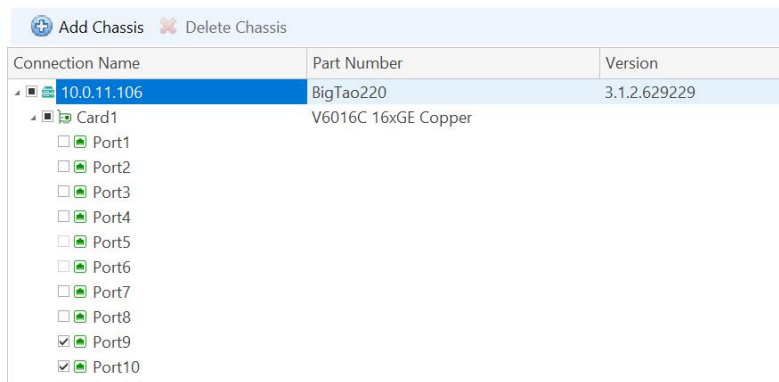
机框 IP 地址

- 在机框显示屏上查看
- 默认为 192.168.0.180

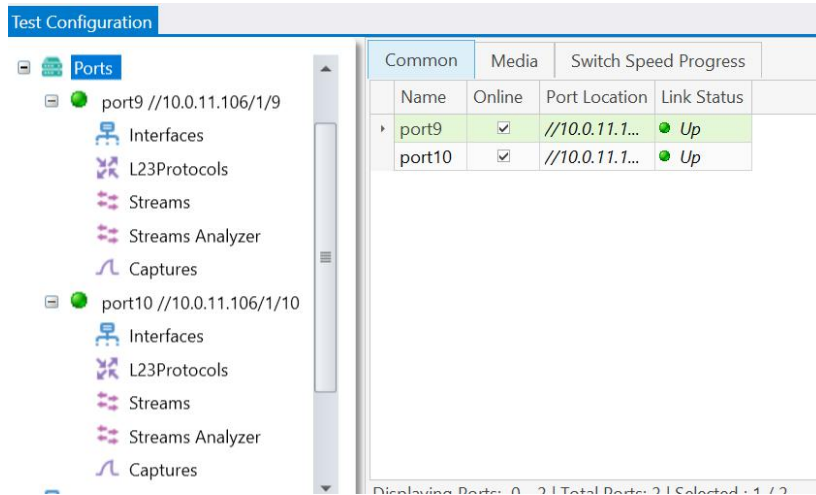


步骤 1-2: 占用 Ports

X Select Chassis

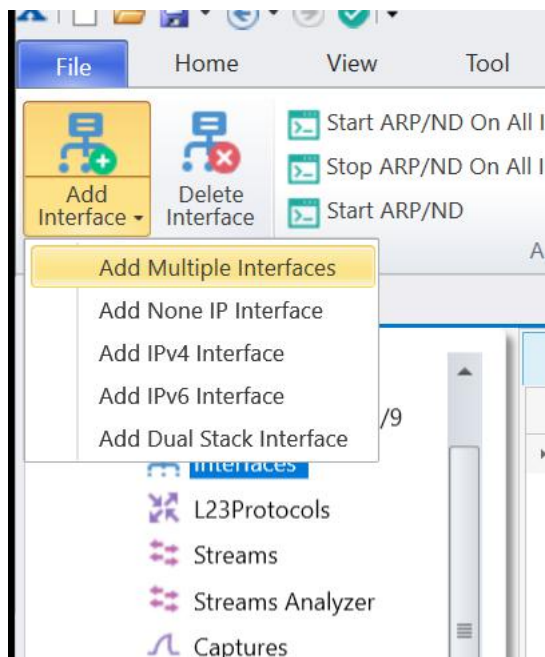


在选中的端口上做测试

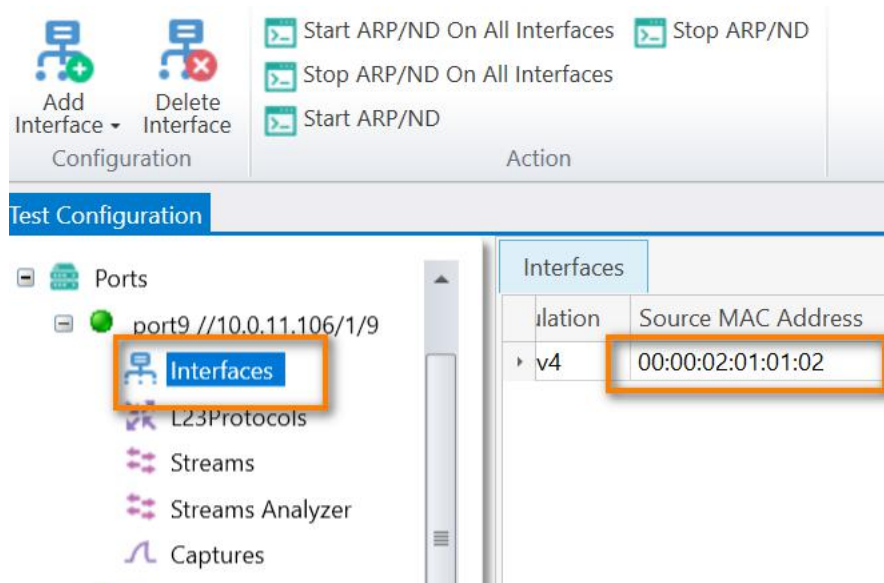


3.2 配置 IP 地址

步骤 2-1: 添加 Interface



手工添加



还可以通过 wizard 方式创建 Interface

步骤 2-2: 修改 Interface

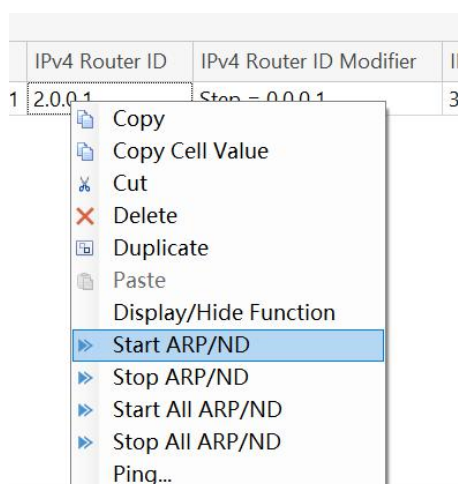
修改接口 IP 地址信息

·网关是 DUT 的 IP

·IPv4 地址是本端的 IP

IPv6 Address	IPv6 Gateway Address	IPv6 Prefix Length	IPv4 Router ID Modifier	IPv6 Address Modifier
2001::2	2001::1	64	Step = 0.0.0.1	Step = ::1

学习 ARP（选中接口，右键）



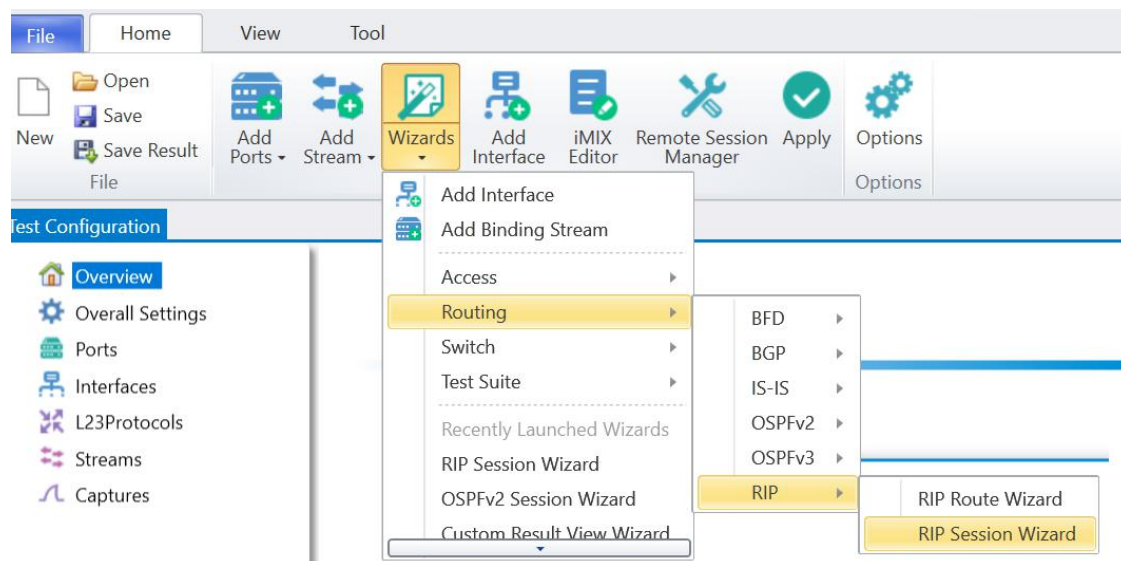
查看是否学习到网关的 MAC 地址

Link Local Generation Type	IPv6 Link Local Address	IPv6 Resolved MAC Address List
EUI-64	fe80::200:2ff:fe01:102	20:0B:C7:9F:7A:3A

3.3 配置 RIPng

步骤 3-1: 向导创建 RIPng

打开向导

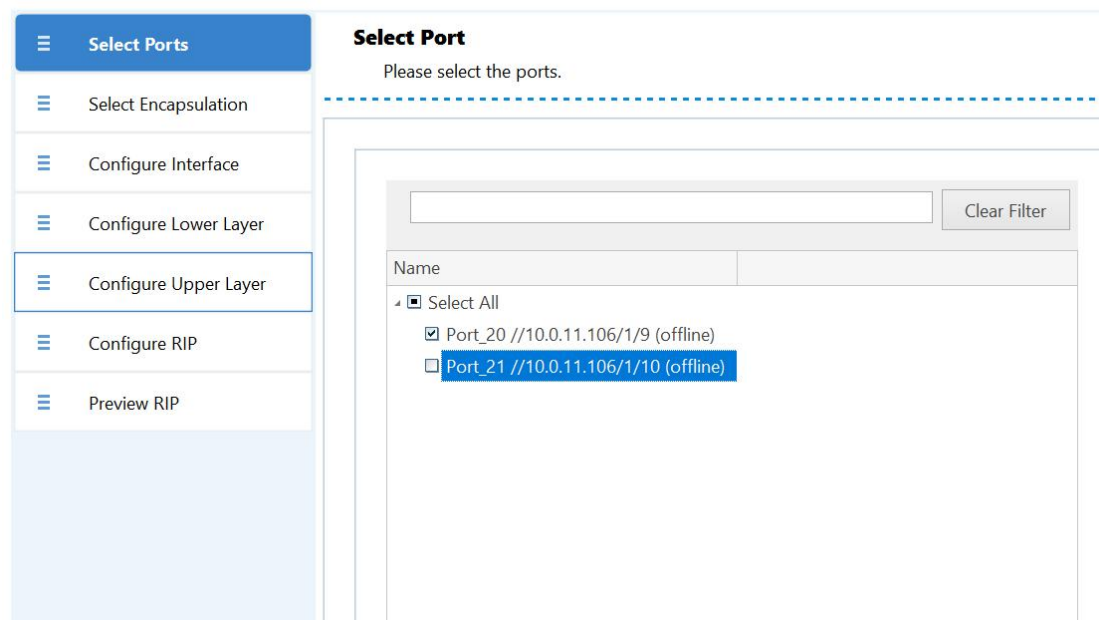


步骤 3-2: 选择端口

选择端口

- 只选择需要建立 RIPng 的端口
- 选择完成以后, 按 Next

RIP Session Wizard



步骤 3-3: 封装协议

·封装协议

选择 IPv6

·VLAN 配置

选配

是否在 Interface 上加上 VLAN

本例中不需要

RIP Session Wizard

The screenshot shows the 'Select Encapsulation' step of the RIP Session Wizard. On the left is a sidebar with a menu containing: 'Select Ports', 'Select Encapsulation' (highlighted), 'Configure Interface', 'Configure Lower Layer', 'Configure Upper Layer', 'Configure RIP', and 'Preview RIP'. The main area is titled 'Select Encapsulation' with the instruction 'Select encapsulation.' Below this, there are two sections: 'Upper Layer' and 'Lower Layer'. In the 'Upper Layer' section, 'Enable IPv4 Address' is unchecked and 'Enable IPv6 Address' is checked. In the 'Lower Layer' section, 'Enable PPPoE' is unchecked, 'Enable Ethernet' is checked, and 'Enable VLAN' is unchecked.

步骤 3-4: 配置 Interface

Interface 配置

·是否默认学习 MAC 地址

·配置 RIPng Router ID

RIP Session Wizard

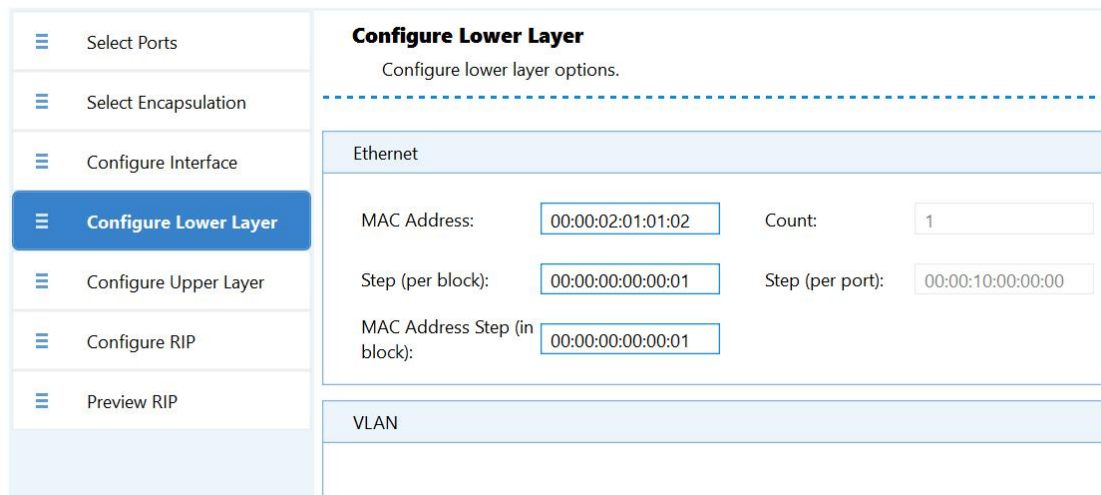
The screenshot shows the 'Configure Interface' step of the RIP Session Wizard. The sidebar menu is the same as in the previous step, but 'Configure Interface' is now highlighted. The main area is titled 'Configure Interface' with the instruction 'Configure interface options.' Below this, there are two sections: 'Interface' and 'Router'. In the 'Interface' section, 'Enable Interface Count' is checked, 'Addresses per Interface' is set to 1, 'Interfaces per Port' is set to 1, and 'Enable Learning Gateway MAC' is checked. In the 'Router' section, 'IPv4 Router ID' is 2.0.0.1, 'IPv4 Router ID Step' is 0.0.0.1, 'IPv6 Router ID' is 2000::1, and 'IPv6 Router ID Step' is ::1.

步骤 3-5: 配置 MAC 层信息

MAC 层信息

·修改 Interface 的 MAC 地址

RIP Session Wizard



The screenshot shows the 'Configure Lower Layer' step of the RIP Session Wizard. The left sidebar contains a menu with options: Select Ports, Select Encapsulation, Configure Interface, **Configure Lower Layer** (highlighted), Configure Upper Layer, Configure RIP, and Preview RIP. The main area is titled 'Configure Lower Layer' with the subtitle 'Configure lower layer options.' Below this, there are two sections: 'Ethernet' and 'VLAN'. The 'Ethernet' section contains fields for MAC Address (00:00:02:01:01:02), Count (1), Step (per block) (00:00:00:00:00:01), Step (per port) (00:00:10:00:00:00), and MAC Address Step (in block) (00:00:00:00:00:01). The 'VLAN' section is currently empty.

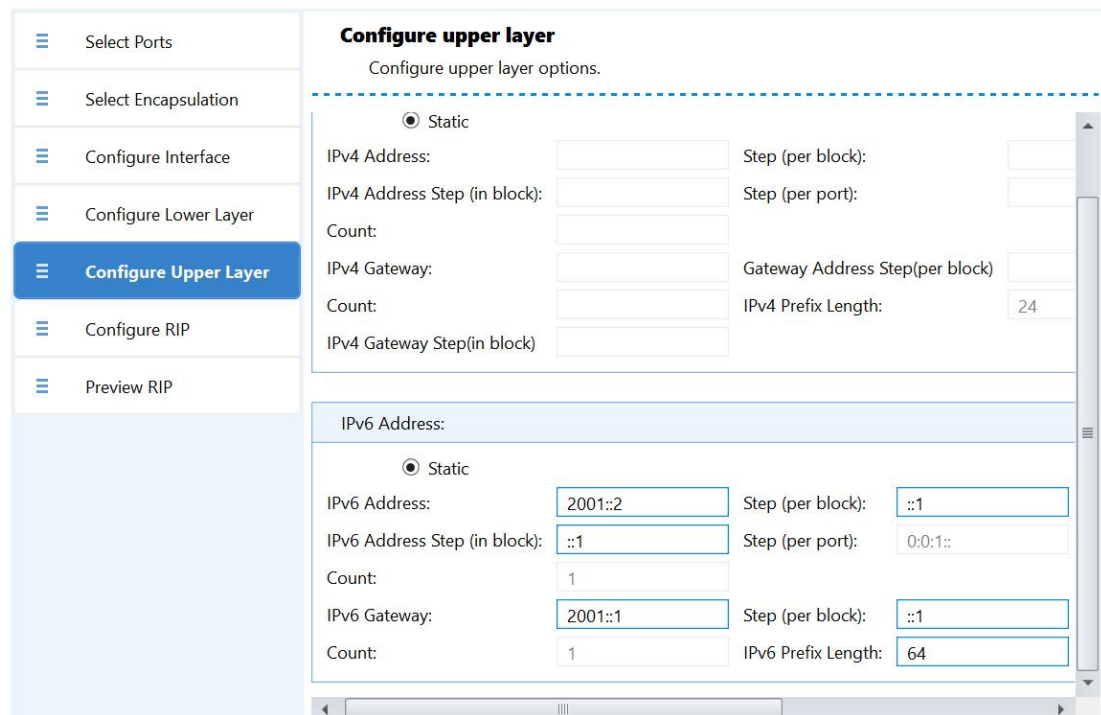
步骤 3-6: 配置 IP 层信息

配置 IP 信息

·本端的 IP 地址

·网关地址(DUT 地址)

RIP Session Wizard



The screenshot shows the 'Configure upper layer' step of the RIP Session Wizard. The left sidebar contains a menu with options: Select Ports, Select Encapsulation, Configure Interface, Configure Lower Layer, **Configure Upper Layer** (highlighted), Configure RIP, and Preview RIP. The main area is titled 'Configure upper layer' with the subtitle 'Configure upper layer options.' Below this, there are two sections: 'IPv4 Address' and 'IPv6 Address'. Both sections have a 'Static' radio button selected. The 'IPv4 Address' section contains fields for IPv4 Address, Step (per block), IPv4 Address Step (in block), Step (per port), Count, IPv4 Gateway, Gateway Address Step(per block), Count, and IPv4 Gateway Step(in block). The 'IPv6 Address' section contains fields for IPv6 Address (2001::2), Step (per block) (::1), IPv6 Address Step (in block) (::1), Step (per port) (0:0:1::), Count (1), IPv6 Gateway (2001::1), Step (per block) (::1), Count (1), and IPv6 Prefix Length (64).

步骤 3-7: 配置 RIPng

配置 RIPng

X RIP Session Wizard

≡ Select Ports

≡ Select Encapsulation

≡ Configure Interface

≡ Configure Lower Layer

≡ Configure Upper Layer

≡ **Configure RIP**

≡ Preview RIP

Configure RIP

Configure RIP protocol options

RIP Version

RIPng

Update Type

Multicast

Update Interval (sec)

30

Update Jitter

0

Max Route Per Update

25

Authentication

None

Password

Xinertel

MD5 Key ID

1

☐ Enable Split Horizon

步骤 3-8: 预览配置的 RIPng

X RIP Session Wizard

— □ ×

≡ Select Ports

≡ Select Encapsulation

≡ Configure Interface

≡ Configure Lower Layer

≡ Configure Upper Layer

≡ Configure RIP

≡ **Preview RIP**

Preview

Preview of the RIP will be created

Port Name	IPv6 Address	IPv6 Gateway Address	IPv6 Address Count	IPv6
Port_20	2001::2	2001::1	1	1

RIPng 邻居的配置结束

Preview

Preview of the RIP will be created

IPv6 Gateway Address Count	IPv6 Link Local Address	MAC Address	RIP Version
	fe80::200:2ff:fe01:102	00:00:02:01:01:02	RIPng

步骤 3-9: 查看配置的 Interface

Add Interface

Delete Interface

Start ARP/ND On All Interfaces

Stop ARP/ND On All Interfaces

Start ARP/ND

Configuration

Action

Test Configuration

Overall Settings

Ports

Port_20 //10.0.11.106/1/9

Interfaces

Port Name	Interface Name	Enable Interface Count	Address Count	Enable Learning Gateway MAC	Edit Encapsulation	Source MAC Address
Port_20	Interface_1	<input checked="" type="checkbox"/>	1	<input checked="" type="checkbox"/>	EthernetII/IPv6	00:00:02:01:01:02

IPv4 Router ID	IPv4 Router ID Modifier	IPv6 Router ID	IPv6 Router ID Modifier	IPv6 Address	IPv6 Address Modifier	IPv6 Prefix Length	IPv6 Gateway Address
2.0.0.1	Step = 0.0.0.1	2000::1	Step = ::1	2001::2	Step = ::1	64	2001::1

进行 ARP 学习, 确保 DUT MAC 能够学习到

Link Local Generation Type	IPv6 Link Local Address	IPv6 Resolved MAC Address List
EUI-64	fe80::200:2ff:fe01:102	20:0B:C7:9F:7A:3A

步骤 3-10: 查看配置的 RIPng

Apply

Start All

Stop All

Delete

Add RIP

Edit RIP

Start RIP

Stop RIP

Advertise RIP

Withdraw RIP

Suspend RIP

Resume RIP

View RIP Route

RIP

Test Configuration

Overall Settings

Ports

Port_20 //10.0.11.106/1/9

Interfaces

L23Protocols

Streams

Streams Analyzer

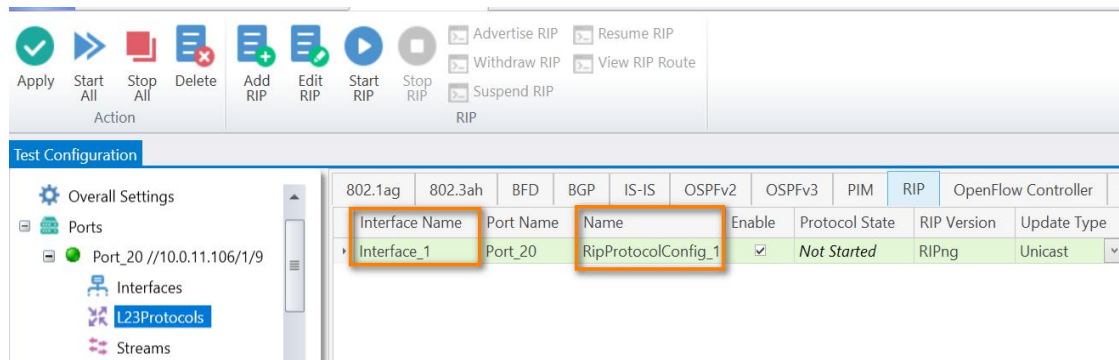
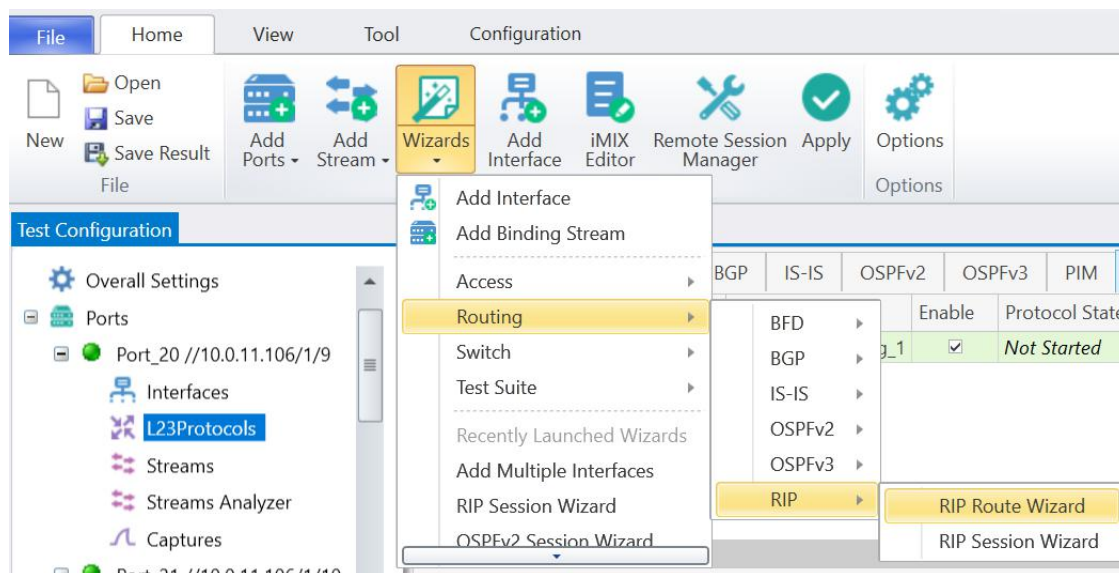
Interface Name	Port Name	Name	Enable	Protocol State	RIP Version	Update Type	DUT IPv4 Address	DUT IPv6 Address	Authentication
Interface_1	Port_20	RipProtocolConfig_1	<input checked="" type="checkbox"/>	Not Started	RIPng	Unicast	224.0.0.9	ff02::9	None

步骤 3-11: 将 Interface 和 RIPng 关联

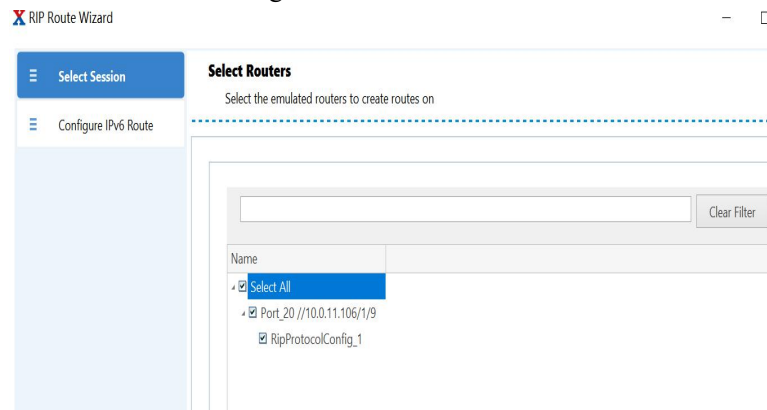
Interface 和 RIPng 关联

·向导创建 默认关联

·手工创建 RIPng, 需要手工关联

**3.4 发布 RIPng Route****步骤 4-1: 向导添加 RIPng Routes****步骤 4-2: 选择 RIPng 接口**

选择需要发布的 RIPng 接口



步骤 4-2: 配置路由

配置发布的路由

X RIP Route Wizard

Select Session

Configure IPv6 Route

Configure IPv6 Routes

Configure IPv6 Routes

Advertising Routes

Total Number of Routes to Create5

IP Prefixes

☐ Prevent Route Aggregation

Starting IPv6 Prefix2003::1

Ending IPv6 Prefix3ffe::

Prefix Length

Prefix Length Distribution TypeFixed

Start Prefix Length64

End Prefix Length64

RIP

Metric1

步骤 4-6: 查看配置的 RIPng Routes

FileHomeViewToolConfiguration

ApplyStart AllStop AllDeleteAdd RIPEdit RIPStart RIPStop RIPAdvertise RIPWithdraw RIPSuspend RIPResume RIPView RIP Route

Test Configuration

Overall Settings

Ports

Port_20 //10.0.11.106/1/9

Interfaces

L23Protocols

Streams

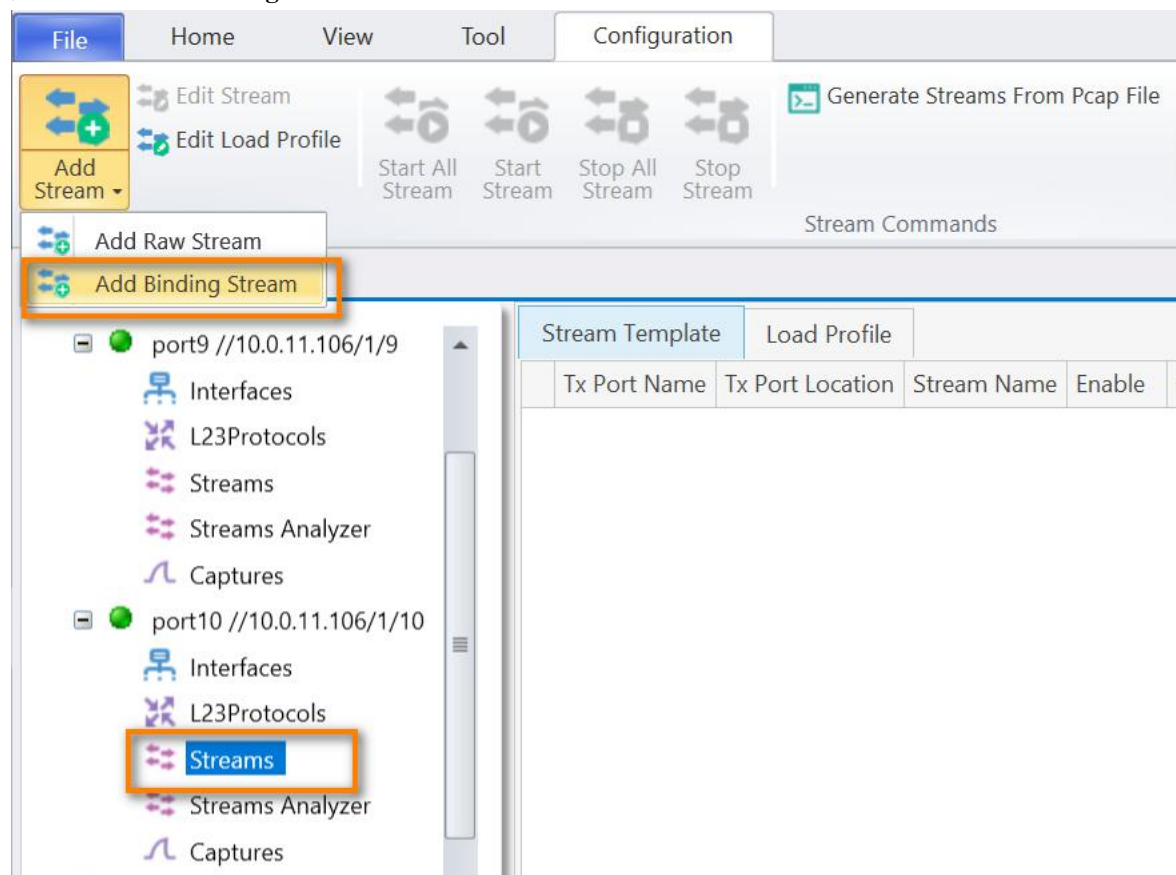
Edit Routes

IPv4 RoutesIPv6 Routes

RIP Session Name	Name	Number of Routes	Start IPv6 Prefix	IPv6 Route Step	End IPv6 Prefix	Prefix Length	Next Hop	Metric	Route
RipProtocolConf...	RipIpv...	5	2003::1	0:0:0:1::	2003:0:0:4::1	64	::	1	0

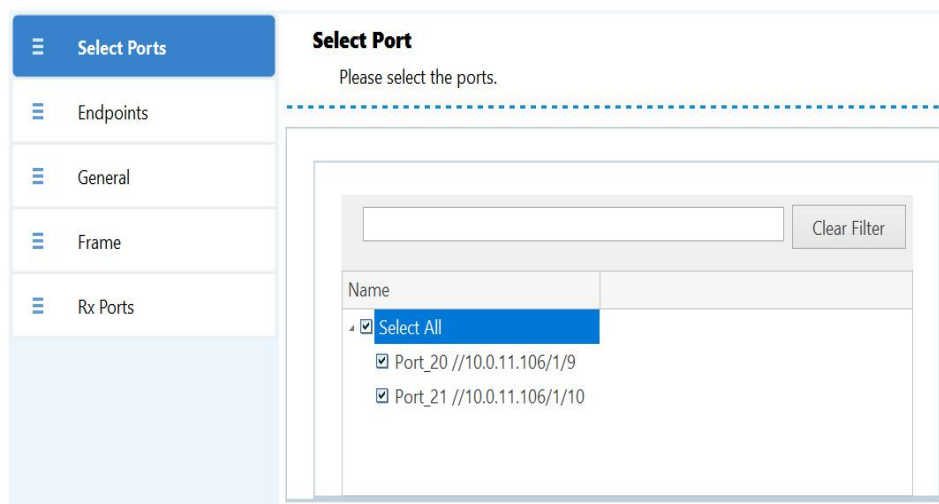
3.5 配置流量

步骤 5-1: Add Binding Stream 配置流量



选择端口

Add Binding Stream



步骤 5-2: Wizard 配置流量

选择流量

· 单向流量

· P2 接口打向 P1

Add Binding Stream

Configure Traffic
Please configure the traffic

Traffic Item

affic Type: IPv6

Traffic Mesh: ☒ One to One, ☐ Many to Many, ☐ Full Mesh

Endpoint Mesh: ☒ Round Robin, ☐ Many to Many

Source and Destination

Source: Select Multiple Ports

Destination: Select Multiple Ports

Interface_2(2002::2/64) -> RipIpv6Route_1(2003::1-2003:0:0:4::1/64)

步骤 5-2: 配置 General

配置 General

· 配置流名称

· 配置帧长度

Add Binding Stream

General Config
Configure general options

Stream Name Prefix: StreamTemplate_1 ☒ Enable Signature

Frame Length Type: Fixed Random Length Seed: 10900842

Fixed Length (byte): 128 Length Step(byte): 1

Min Length (byte): 128 Max Length (byte): 256

iMIX Template: Default

Payload Type: Cycle Payload Value (hex): 0

Address Learning Mode: L3 Learning

步骤 5-3: 配置 Frame 格式

本页面不用修改

Add Binding Stream

Name	Value
Frame	
EthernetII Header	
Destination MAC Address	00:00:00:13:40:20
Source MAC Address	<AUTO> 00:00:02:01:01:03
Protocol Type (hex)	<AUTO> IPv6
IPv6 Header	
Version (int)	<AUTO> 6
Traffic Class (int)	00
Flow Label (int)	0
Payload Length (int)	<AUTO> 0
Next Header (int)	<AUTO> IPv6-NoNxt
Hop Limit (int)	255
Source Address	<AUTO> 2002::2
Destination Address	<AUTO> 2003::1

Hex Editor

```
00 01 02 03 04 05 06 07 08 09 0a 0b 0c 0d 0e 0f
00000000 00 00 00 13 40 20 00 00 02 01 03 86 dd 60 00 .....@.....Y*
00000010 00 00 00 00 3b ff 20 02 00 00 00 00 00 00 00 00 .....;y.....
00000020 00 00 00 00 00 02 20 03 00 00 00 00 00 00 00 00 .....
00000030 00 00 00 00 00 01 .....
```

步骤 5-4: 选择 Rx 端口

选择流量接收端口

·可选

Add Binding Stream

Configure RxPort

Configure Rx ports to receive this stream block

All Ports

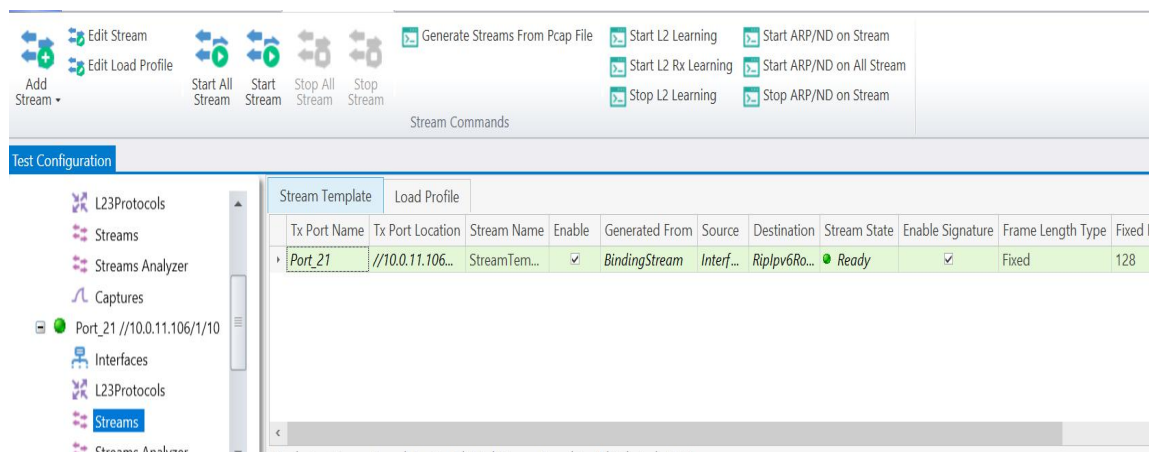
- port9 //10.0.11.106/1/9
- port10 //10.0.11.106/1/10

Rx Ports

Buttons: Add >>, << Remove

Bottom Buttons: Back, Next, Finish, Exit

步骤 5-5: 查看配置的 Stream



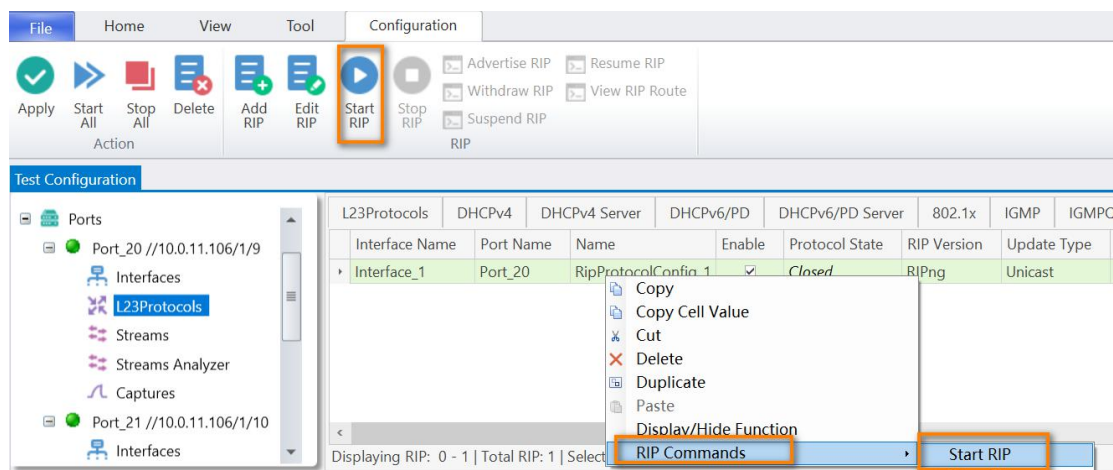
3.6 启用 RIPng

步骤 6-1: 启动 RIPng

方法 1: 启动 RIPng

·选中

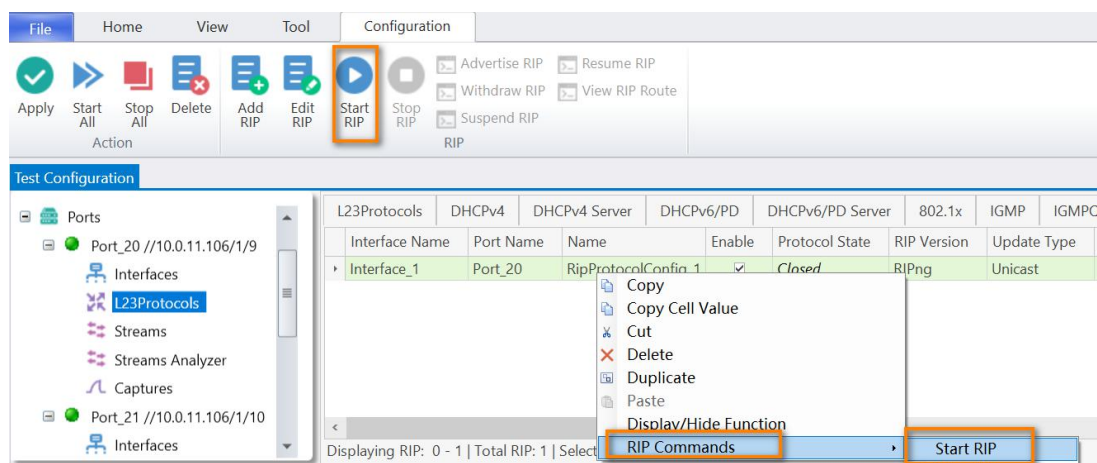
·点击 Start RIPng



方法 2

·右键选中

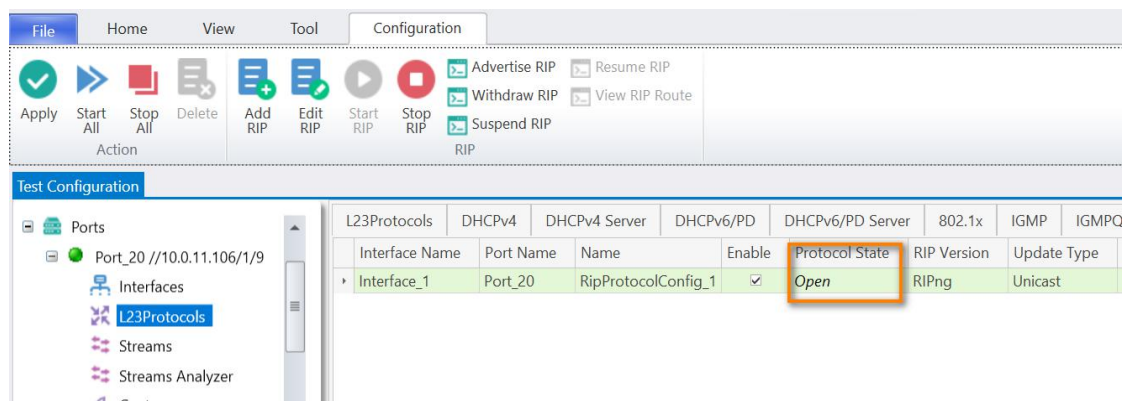
·点击 Start RIPng



步骤 6-2: 查看 RIPng 状态

查看状态

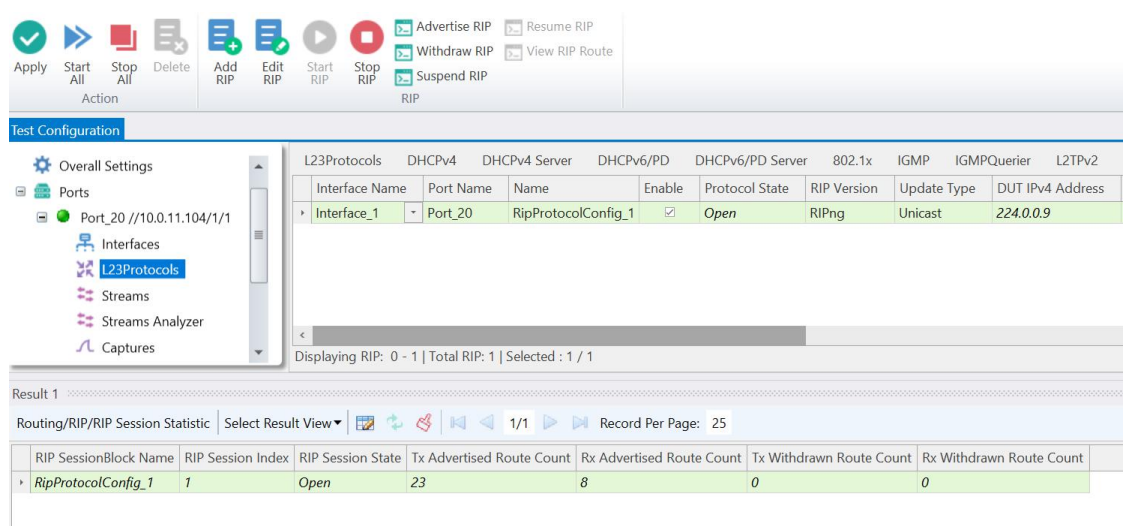
·状态变为 Open 以后, 表明邻居建立成功



步骤 6-3: 查看 RIPng 统计

查看会话状态

查看 OSPFv3 报文收发状态

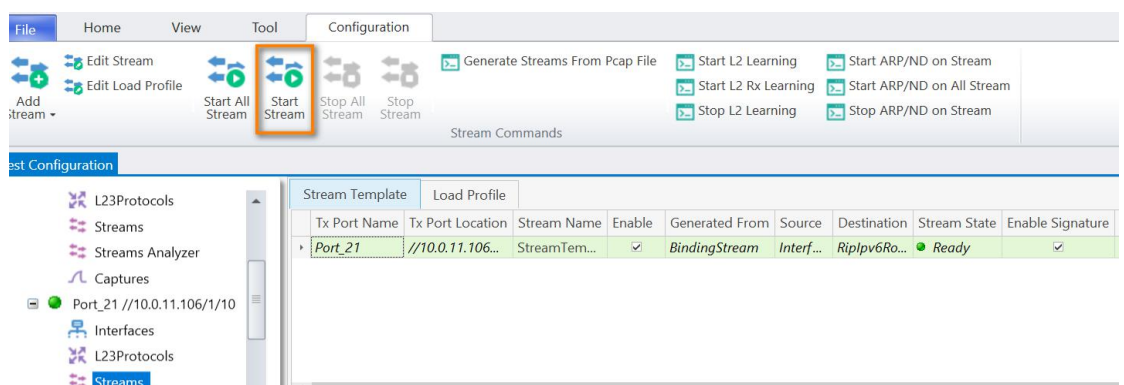


3.7 发流验证

发流验证

·选中流量

·点击 start

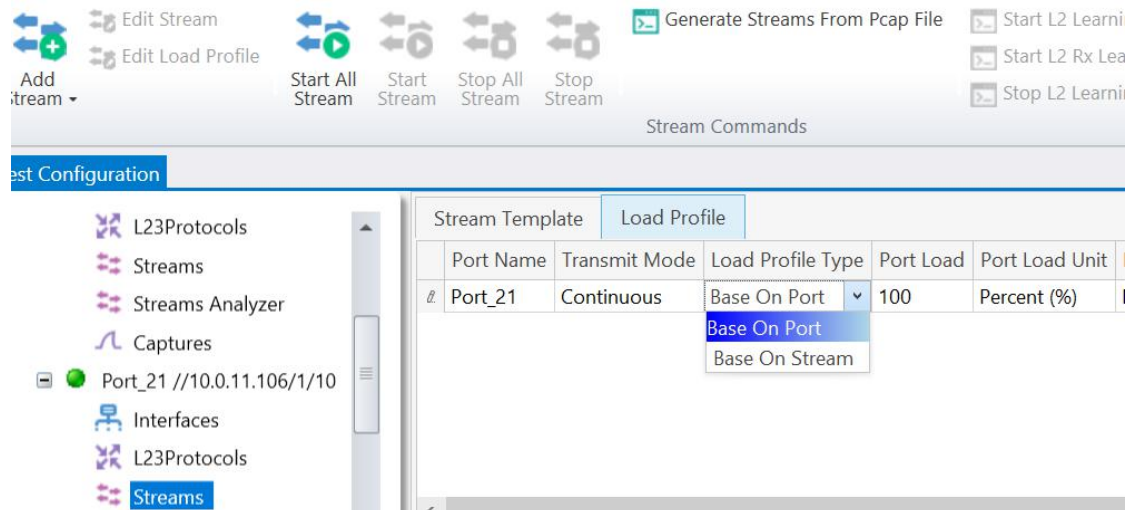


步骤 7-2: 切换 Load 模式

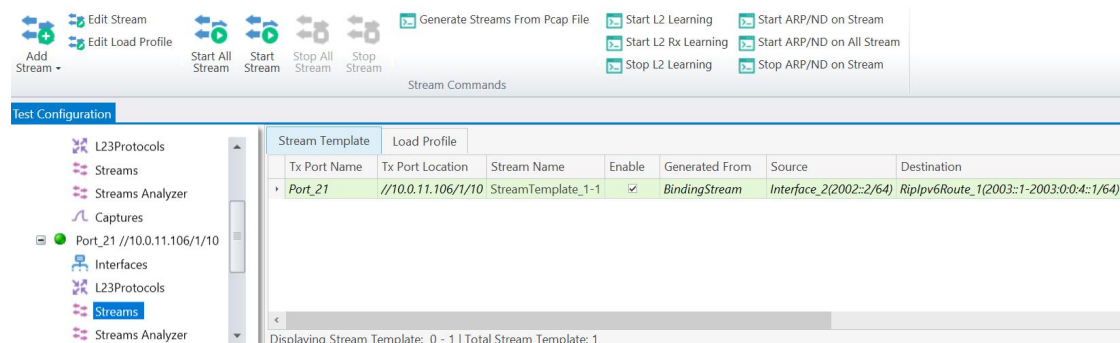
切换模式

·默认基于端口

·切换到基于 Stream

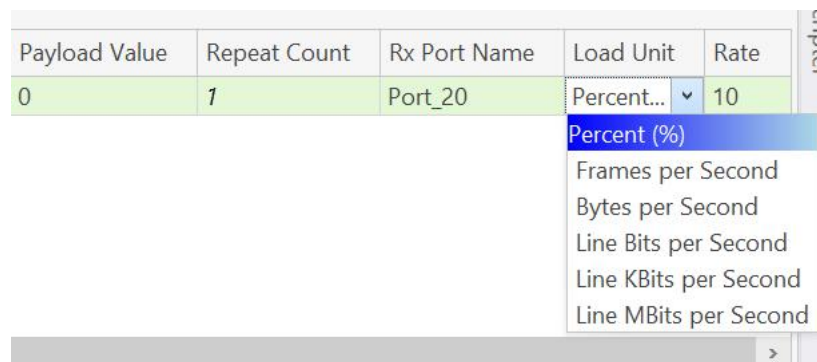


步骤 7-3: 修改 Load 值



修改 load 值

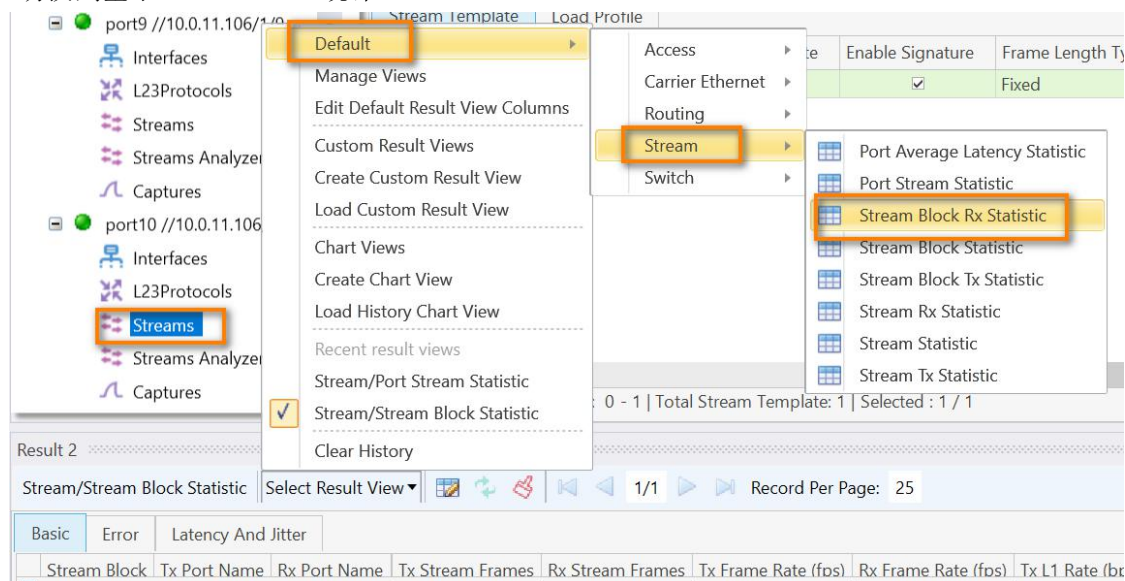
·在每个 Stream 上进行修改



步骤 7-4: 切换到 Stream Block 统计

切换统计

- 默认基于端口统计
- 切换到基于 stream Block 统计



步骤 7-5: 查看统计

查看统计

- 速率
- 时延
- 丢包
-

Result 2							
Stream/Stream Block Statistic							
Select Result View							
1/1							
Record Per Page: 25							
Basic Error Latency And Jitter							
Stream Block							
Tx Port Name Rx Port Name Tx Stream Frames Rx Stream Frames Tx Frame Rate (fps) Rx Frame Rate (fps)							
StreamTemplate_1-1 Port_21 Port_20 1,272,259 1,267,420 84,459 84,460							
Tx Utilization (%) Rx Utilization (%) Realtime Lost Frames Realtime Loss Rate (%) Tx Byte Rate Rx Byte Rate Tx Bit Rate (bps) Rx Bit Rate (bps)							
9.999946 10.000064 0 0 10,810,752 10,810,880 86,486,016 86,487,040							
Stream/Stream Block Statistic							
Select Result View							
1/1							
Record Per Page: 25							
Basic Error Latency And Jitter							
Stream Block Tx Port Name Rx Port Name Min Latency (us) Average Latency (us) Max Latency (us) Min Jitter (us) Average Jitter (us) Max Jitter (us)							
StreamTemplate_1-1 Port_21 Port_20 3.592 4.167 5.16 0 0.15 1.216							

华为三层交换机的配置

```
interface GigabitEthernet0/0/1
undo portswitch
  ipv6 enable
  ipv6 address 2001::1/64
  ripng 10 enable
#
interface GigabitEthernet0/0/10
undo portswitch
  ipv6 enable
  ipv6 address 2002::1/64
#
-----
#
RIPng 10

#
```

三层交换机的状态

```
[L3]display ripng 10 neighbor
Neighbor : FE80::200:2FF:FE01:102 GigabitEthernet0/0/9
Protocol : RIPNG
```

DUT 状态

邻居状态建立成功

Routes 都学习到

```
[L3]display ripng 10 route
Route Flags: R - RIPng
              A - Aging, G - Garbage-collect
-----
Peer FE80::200:2FF:FE01:102 on GigabitEthernet0/0/9
Dest 2003::/64,
  via FE80::200:2FF:FE01:102, cost 1, tag 0, RA, 15 Sec
Dest 2003:0:0:1::/64,
  via FE80::200:2FF:FE01:102, cost 1, tag 0, RA, 15 Sec
Dest 2003:0:0:2::/64,
  via FE80::200:2FF:FE01:102, cost 1, tag 0, RA, 15 Sec
Dest 2003:0:0:3::/64,
  via FE80::200:2FF:FE01:102, cost 1, tag 0, RA, 15 Sec
Dest 2003:0:0:4::/64,
  via FE80::200:2FF:FE01:102, cost 1, tag 0, RA, 15 Sec
```