计算机网络实验报告

警示

1.实验报告如有雷同，雷同各方当次实验成绩均以 0 分计。
2.当次小组成员成绩只计学号、姓名登录在下表中的。
3.在规定时间内未上交实验报告的，不得以其他方式补交，当次成绩按 0 分计。
4.实验报告文件以 PDF 格式提交。

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实验：端口聚合配置实验

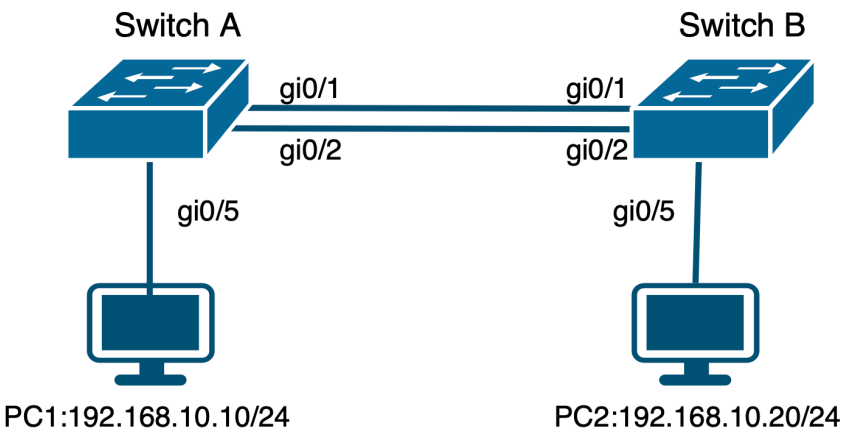
实验目的：理解链路聚合的配置及原理

技术原理：端口聚合又称链路聚合，是指在物理上讲两台交换机之间的多个端口连接起来，将多条链路聚合成一条逻辑链路以增大链路带宽，解决交换网络中因带宽引起的网络瓶颈问题。多条物理链路之间能够相互冗余备份，其中某条链路断开不会影响其他链路正常转发数据。

端口聚合遵循 IEEE 802.3ad 协议标准

实验设备：交换机 2 台，计算机 2 台，直连线 4 根

实验拓扑：



2 台交换机都配置完端口聚合后再将 2 台交换机连接起来，如果先连线再配置会造成广播风暴，影响交换机的正常工作。

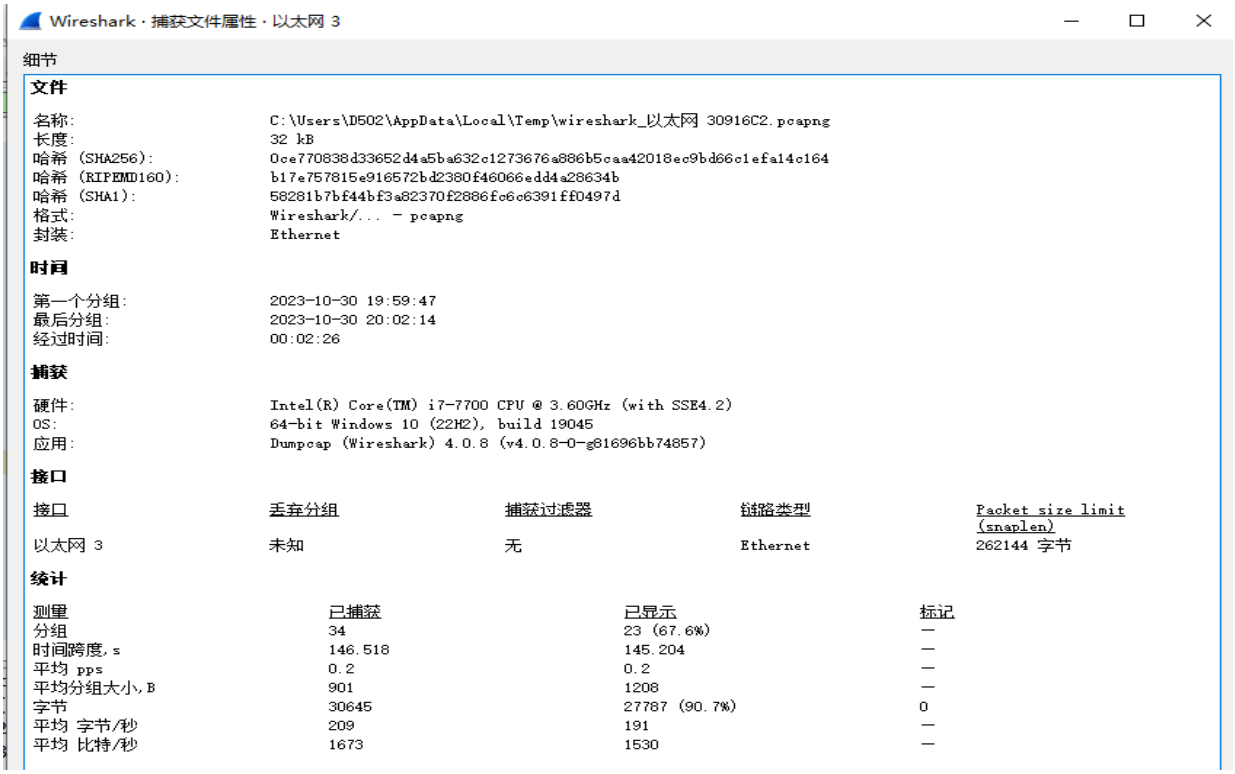
实验步骤：

分析：本实验的预期是将两台交换机的 2 个各 1000M 的端口聚合成 2000M 的链路。在增加交换机之间的传输带宽的同时，实现链路冗余备份。

步骤 1：按照上述拓扑图连接好网络拓扑，2 台交换机之间只接 1 根跳线（如端口 0/1）。

实验前的带宽验证：

在 PC2 上建立一个共享目录（c:\share），并启动 Wireshark 抓包软件，选中监控对象，观察此时数据包的传输情况。



Wireshark · 捕获文件属性 · 以太网 3

细节

文件

名称:	C:\Users\D502\AppData\Local\Temp\wireshark_以太网 30916C2.pcapng
长度:	32 kB
哈希 (SHA256):	0ce770838d33652d4a5ba632c1273676a886b5caa42018ec9bd66c1efa14c164
哈希 (RIPEMD160):	b17e757815e916572bd2380f46066edd4a28634b
哈希 (SHA1):	58281b7bf44bf3a82370f2886fc6c6391ff0497d
格式:	Wireshark/... - pcapng
封装:	Ethernet

时间

第一个分组:	2023-10-30 19:59:47
最后分组:	2023-10-30 20:02:14
经过时间:	00:02:26

捕获

硬件:	Intel(R) Core(TM) i7-7700 CPU @ 3.60GHz (with SSE4.2)
OS:	64-bit Windows 10 (22H2), build 19045
应用:	Dumpcap (Wireshark) 4.0.8 (v4.0.8-0-g81696bb74857)

接口

接口	丢弃分组	捕获过滤器	链路类型	Packet size limit (snaplen)
以太网 3	未知	无	Ethernet	262144 字节

统计

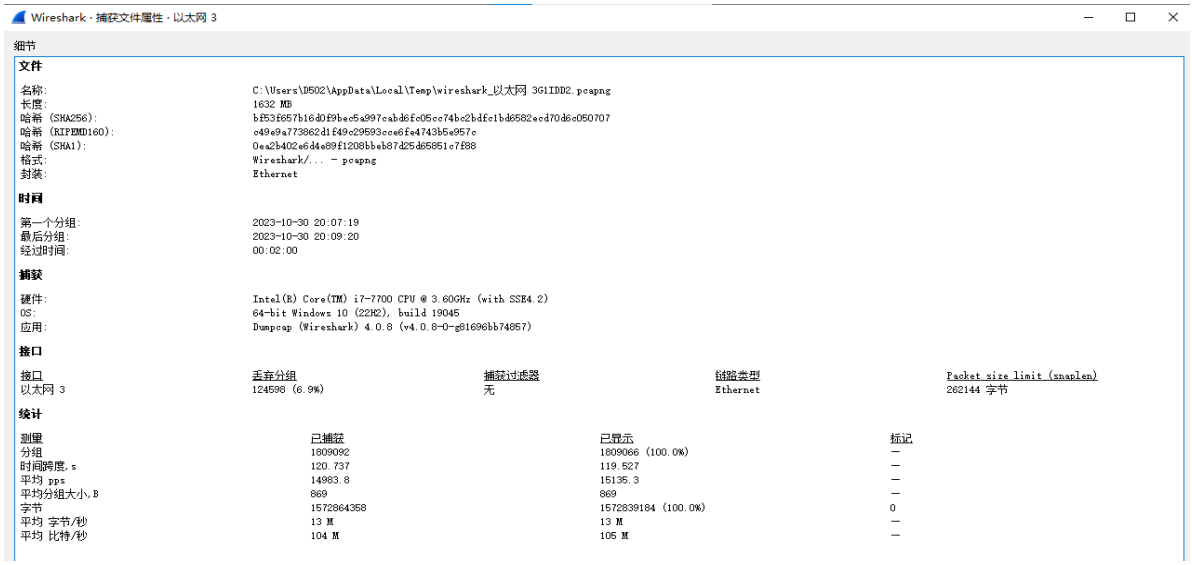
测量	已捕获	已显示	标记
分组	34	23 (67.6%)	—
时间跨度, s	146.518	145.204	—
平均 pps	0.2	0.2	—
平均分组大小, B	901	1208	—
字节	30645	27787 (90.7%)	0
平均 字节/秒	209	191	—
平均 比特/秒	1673	1530	—

在 Windows 中，共享目录（c:\share）在命令提示符窗口的建立过程如下：

```
md c:\share
net user myuser 159357 /add
net share myshare=c:\share /grant:myuser,full
```

```
Microsoft Windows [版本 10.0.19045.3324]
(c) Microsoft Corporation。保留所有权利。

C:\Windows\system32>md c:\share

C:\Windows\system32>net user myuser 159357 /add
命令成功完成。


C:\Windows\system32>net share myshare=c:\share /grant:myuser,full
myshare 共享成功。
```

在 PC1 上选择一个文件包（文件大小一般需较大，如视频文件），在“开始”中“搜索程序和文件”的对话框中输入“\\192.168.10.20\myshare”，输入用户名/口令，即可进入共享文件夹。将文件包复制到 PC2 的共享文件夹中，注意观察包数量的变化，记录 Packets、Packets/s 的代表 值 。



步骤 2：交换机 A 的基本配置

```
11-S5750-1(config)#vlan 10
11-S5750-1(config-vlan)#name sales
11-S5750-1(config-vlan)#exit
11-S5750-1(config)#interface gigabitethernet 0/5

11-S5750-1(config-if-GigabitEthernet 0/5)#switchport access vlan 10
11-S5750-1(config-if-GigabitEthernet 0/5)#
```

步骤 3：在交换机 A 上配置聚合端口

```
11-S5750-1(config)#interface aggregateport 1
11-S5750-1(config-if-AggregatePort 1)#switchport mode trunk
11-S5750-1(config-if-AggregatePort 1)#exit
11-S5750-1(config)#interface range gigabitethernet 0/1-2
11-S5750-1(config-if-range)#port-group 1
```

测试：验证端口 0/1 和端口 0/2 属于 AG1.

```
11-S5750-1(config-if-range)#show aggregatePort 1 summary
AggregatePort MaxPorts SwitchPort Mode   Ports
------------- -------- ---------- ------ --------------------
Ag1           8        Enabled    TRUNK  Gi0/1   ,Gi0/2
```

步骤 4：交换机 B 的基本配置。

```
11-S5750-2(config)#vlan 10
11-S5750-2(config-vlan)#name sales
11-S5750-2(config-vlan)#exit
11-S5750-2(config)#interface gigabitethernet 0/5
11-S5750-2(config-if-GigabitEthernet 0/5)#switchport access vlan 10
```

测试：验证已在交换机 B 上创建了 VLAN 10，并已将端口 0/5 划分到 VLAN 10 中。

```
11-S5750-2(config-if-GigabitEthernet 0/5)#show vlan id 10
VLAN Name                            Status    Ports
---- ------------------------------- --------- ---------------------
---
  10 sales                           STATIC    Gi0/5
```

步骤 5：在交换机 B 上配置聚合端口。

```
11-S5750-2(config-if-GigabitEthernet 0/5)#interface aggregateport 1
11-S5750-2(config-if-AggregatePort 1)#switchport mode trunk
11-S5750-2(config-if-AggregatePort 1)#exit
11-S5750-2(config)#interface range gigabitethernet 0/1-2
11-S5750-2(config-if-range)#port-group 1
```

测试：验证端口 0/1 和端口 0/2 属于 AG1.

```
11-S5750-2(config-if-range)#show aggregatePort 1 summary
AggregatePort MaxPorts SwitchPort Mode   Ports
------------- -------- ---------- ------ --------------------------
Ag1           8        Enabled    TRUNK  Gi0/1   ,Gi0/2
```

按照网络拓扑图，连接 2 台交换机之间的另一根跳线（端口 0/2）

步骤 6：验证

（1）在 PC1 上传送文件包，注意观察包数量的变化，记录数据传送时间，填入表中

测试项	端口聚合前	端口聚合后
端口速度	14983.8 packets/sec	12395.2 packets/sec
聚合端口实测最大传输速度（包/秒）	112300	115700
传输时间（秒）	18	18
聚合端口的流量平衡模式	未启用	未启用

链路聚合的带宽没有增大，当存在不同的源地址或者目的地址的链接使网络流量增大而出现瓶颈时，链路的分流才会起到作用。而链路聚合带宽传输速度没有增大，可能是因为实验的数据传输还不足以产生瓶颈，数据大部分都从一条链路转发而没有均衡分配。

（2）在本实验中，如何判断哪条链路正在传输数据？

```
11-S5750-2#show interfaces counters

Interface : GigabitEthernet 0/1
5 minutes input rate  :2416276 bits/sec, 197 packets/sec
5 minutes output rate :91374 bits/sec, 166 packets/sec
InOctets              : 5007137110
InUcastPkts           : 3297685
InMulticastPkts       : 41
InBroadcastPkts       : 98
OutOctets             : 180102769
OutUcastPkts          : 2686958
OutMulticastPkts      : 53
OutBroadcastPkts      : 45
Undersize packets     : 0
Oversize packets      : 0
collisions            : 0
Fragments             : 0
Jabbers               : 0
CRC alignment errors  : 0
AlignmentErrors       : 0
FCSErrors             : 0
dropped packet events (due to lack of resources): 0
packets received of length (in octets):
  64 : 416
  65-127 : 583
  128-255 : 889
  256-511 : 4664
  512-1023 : 181
  1024-1518 : 1097146
```

```
Interface : GigabitEthernet 0/2
5 minutes input rate  :149 bits/sec, 0 packets/sec
5 minutes output rate :1611 bits/sec, 0 packets/sec
InOctets              : 8562
InUcastPkts           : 0
InMulticastPkts       : 30
InBroadcastPkts       : 1
OutOctets             : 81451
OutUcastPkts          : 0
OutMulticastPkts      : 15
OutBroadcastPkts      : 53
Undersize packets     : 0
Oversize packets      : 0
collisions            : 0
Fragments             : 0
Jabbers               : 0
CRC alignment errors  : 0
AlignmentErrors       : 0
FCSErrors             : 0
dropped packet events (due to lack of resources): 0
packets received of length (in octets):
  64 : 0
  65-127 : 0
  128-255 : 30
  256-511 : 0
  512-1023 : 0
  1024-1518 : 1
```

通过判断数据在不同链路上的传输数据量的多少来判断哪条链路用于数据传输。

从上图可以看到，Gi0/1 在 5 分钟内的输入速率是 2416276 bits/sec，Gi0/2 在 5 分钟内的输入速率是 149 bits/sec，因此 Gi0/1 是正在主要传输的链路，Gi0/2 传输的内容远少于 Gi0/1。

（3）链路聚合的动态备份：当交换机之间的一条链路断开时，PC1 与 PC2 仍能相互通信。

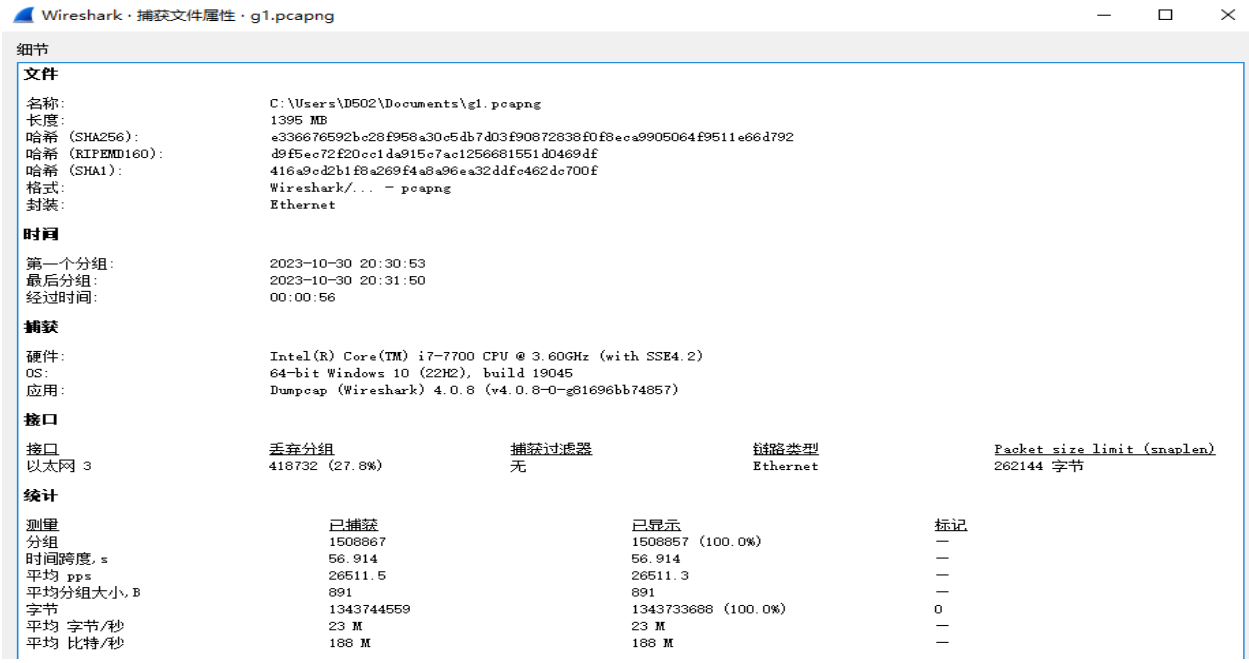
```
C:\Users\D502>ping 192.168.10.10 -t

正在 Ping 192.168.10.10 具有 32 字节的数据:
来自 192.168.10.10 的回复: 字节=32 时间<1ms TTL=128
来自 192.168.10.10 的回复: 字节=32 时间<1ms TTL=128
来自 192.168.10.10 的回复: 字节=32 时间<1ms TTL=128
来自 192.168.10.10 的回复: 字节=32 时间=1ms TTL=128
来自 192.168.10.10 的回复: 字节=32 时间<1ms TTL=128
来自 192.168.10.10 的回复: 字节=32 时间=1ms TTL=128
来自 192.168.10.10 的回复: 字节=32 时间=1ms TTL=128

192.168.10.10 的 Ping 统计信息:
    数据包: 已发送 = 7, 已接收 = 7, 丢失 = 0 (0% 丢失),
往返行程的估计时间(以毫秒为单位):
    最短 = 0ms, 最长 = 1ms, 平均 = 0ms
```

```
C:\Users\D502>ping 192.168.10.20 -t

正在 Ping 192.168.10.20 具有 32 字节的数据:
来自 192.168.10.20 的回复: 字节=32 时间=1ms TTL=128
来自 192.168.10.20 的回复: 字节=32 时间=1ms TTL=128
来自 192.168.10.20 的回复: 字节=32 时间<1ms TTL=128
来自 192.168.10.20 的回复: 字节=32 时间<1ms TTL=128
来自 192.168.10.20 的回复: 字节=32 时间=1ms TTL=128
来自 192.168.10.20 的回复: 字节=32 时间<1ms TTL=128
来自 192.168.10.20 的回复: 字节=32 时间<1ms TTL=128
来自 192.168.10.20 的回复: 字节=32 时间=1ms TTL=128
来自 192.168.10.20 的回复: 字节=32 时间<1ms TTL=128

192.168.10.20 的 Ping 统计信息:
    数据包: 已发送 = 10, 已接收 = 10, 丢失 = 0 (0% 丢失),
往返行程的估计时间(以毫秒为单位):
    最短 = 0ms, 最长 = 1ms, 平均 = 0ms
```

将两条跳线中的任何一根拔掉后，发现计算机间还可以正常通信，说明链路聚合的动态备份有效，拔线的过程中无丢包现象。

（4）重做步骤 5 验证（1），在数据传送过程中，交替拔掉端口 1（或 2）的线，观察 Packets 与 Packets/s 是否有变化？

保留端口 0/1 的跳线



保留端口 0/2 的跳线

Wireshark · 捕获文件属性 · g2.pcapng

细节

文件

名称:	C:\Users\D502\Documents\g2.pcapng
长度:	1469 MB
哈希 (SHA256):	b1aeaa7f559dbeb38a2d4c1d8e16e146c305cad5a491e95232fb87e23bb509e5
哈希 (RIPEMD160):	47f454258fa08d63b934087c44685cc405b8bae8
哈希 (SHA1):	fc5a59da9695ddc5fcb18ef2340653fb3ca89d26
格式:	Wireshark/... - pcapng
封装:	Ethernet

时间

第一个分组:	2023-10-30 20:33:30
最后分组:	2023-10-30 20:34:58
经过时间:	00:01:27

捕获

硬件:	Intel(R) Core(TM) i7-7700 CPU @ 3.60GHz (with SSE4.2)
OS:	64-bit Windows 10 (22H2), build 19045
应用:	Dumpcap (Wireshark) 4.0.8 (v4.0.8-0-g81696bb74857)

接口

接口	丢弃分组	捕获过滤器	链路类型	Packet size limit (snaplen)
以太网 3	343666 (21.4%)	无	Ethernet	262144 字节

统计

测量	已捕获	已显示	标记
分组	1607353	1607331 (100.0%)	—
时间跨度,s	87.763	85.365	—
平均 pps	18314.8	18828.9	—
平均分组大小,B	880	880	—
字节	1414365451	1414346896 (100.0%)	0
平均 字节/秒	16 M	16 M	—
平均 比特/秒	128 M	132 M	—

①断开 Gi0/2 时，平均 pps 为 26511.5

②断开 Gi0/1 时，平均 pps 为 18314.8

（5）查看聚合端口：show interfaces aggregateport 1。

```
11-S5750-1(config)#show interfaces aggregateport 1
Index(dec):29 (hex):1d
AggregatePort 1 is UP  , line protocol is UP
Hardware is Aggregate Link AggregatePort
Interface address is: no ip address
  MTU 1500 bytes, BW 2000000 Kbit
  Encapsulation protocol is Bridge, loopback not set
  Keepalive interval is 10 sec , set
  Carrier delay is 2 sec
  Rxload is 1/255, Txload is 13/255
  Switchport attributes:
    interface's description:""
    admin medium-type is Copper, oper medium-type is Copper
    lastchange time: 0 Day: 0 Hour:30 Minute:43 Second
    current status duration: 0 Day: 0 Hour: 4 Minute:34 Second
    Priority is 0
    admin duplex mode is AUTO, oper duplex is Full
    admin speed is AUTO, oper speed is 1000M
    flow control admin status is OFF, flow control oper status is OFF
    admin negotiation mode is OFF, oper negotiation state is OFF
    Storm Control: Broadcast is ON, Multicast is OFF, Unicast is ON
  Port-type: trunk
    Native vlan: 1
    Allowed vlan lists: 1-4094
    Active vlan lists: 1,10
Aggregate Port Informations:
        Aggregate Number: 1
        Name: "AggregatePort 1"
        Refs: 2
        Members: (count=2)
        GigabitEthernet 0/1             Link Status: Up
        GigabitEthernet 0/2             Link Status: Up
  5 minutes input rate 4059820 bits/sec, 7438 packets/sec
  5 minutes output rate 107360552 bits/sec, 8829 packets/sec
    1851723 packets input, 126340266 bytes, 0 no buffer, 0 dropped
    Received 34 broadcasts, 0 runts, 0 giants
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 abort
    2198125 packets output, 3340899462 bytes, 0 underruns , 0 dropped
    0 output errors, 0 collisions, 0 interface resets
```

```
11-S5750-2(config)#show interfaces aggregateport 1
Index(dec):29 (hex):1d
AggregatePort 1 is UP  , line protocol is UP
Hardware is Aggregate Link AggregatePort
Interface address is: no ip address
  MTU 1500 bytes, BW 1000000 Kbit
  Encapsulation protocol is Bridge, loopback not set
  Keepalive interval is 10 sec , set
  Carrier delay is 2 sec
  Rxload is 5/255, Txload is 1/255
  Switchport attributes:
    interface's description:""
    admin medium-type is Copper, oper medium-type is Copper
    lastchange time: 0 Day: 0 Hour:30 Minute:44 Second
    current status duration: 0 Day: 0 Hour:19 Minute:15 Second
    Priority is 0
    admin duplex mode is AUTO, oper duplex is Full
    admin speed is AUTO, oper speed is 1000M
    flow control admin status is OFF, flow control oper status is OFF
    admin negotiation mode is OFF, oper negotiation state is OFF
    Storm Control: Broadcast is ON, Multicast is OFF, Unicast is ON
  Port-type: trunk
    Native vlan: 1
    Allowed vlan lists: 1-4094
    Active vlan lists: 1,10
Aggregate Port Informations:
        Aggregate Number: 1
        Name: "AggregatePort 1"
        Refs: 2
        Members: (count=2)
        GigabitEthernet 0/1             Link Status: Down
        GigabitEthernet 0/2             Link Status: Up
  5 minutes input rate 20156425 bits/sec, 1655 packets/sec
  5 minutes output rate 703032 bits/sec, 1281 packets/sec
    4396454 packets input, 6681852771 bytes, 0 no buffer, 0 dropped
    Received 140 broadcasts, 0 runts, 0 giants
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 abort
    3532704 packets output, 241145943 bytes, 0 underruns , 0 dropped
    0 output errors, 0 collisions, 0 interface resets
```

（6）查看成员端口：show interfaces gigabitethernet 0/1。

```
11-S5750-1#show interfaces gigabitethernet 0/1
Index(dec):1 (hex):1
GigabitEthernet 0/1 is DOWN, line protocol is DOWN
Hardware is Broadcom 5464 GigabitEthernet
Interface address is: no ip address
  MTU 1500 bytes, BW 1000000 Kbit
  Encapsulation protocol is Bridge, loopback not set
  Keepalive interval is 10 sec , set
  Carrier delay is 2 sec
  Rxload is 1/255, Txload is 1/255
  Switchport attributes:
    interface's description:""
    admin medium-type is Copper, oper medium-type is Copper
    lastchange time: 0 Day: 0 Hour:22 Minute: 6 Second
    current status duration: 0 Day: 0 Hour:29 Minute: 1 Second
    Priority is 0
    admin duplex mode is AUTO, oper duplex is Unknown
    admin speed is AUTO, oper speed is Unknown
    flow control admin status is OFF, flow control oper status is Unknown
    admin negotiation mode is OFF, oper negotiation state is ON
    Storm Control: Broadcast is ON, Multicast is OFF, Unicast is ON
  5 minutes input rate 0 bits/sec, 0 packets/sec
  5 minutes output rate 0 bits/sec, 0 packets/sec
    3515912 packets input, 236703439 bytes, 0 no buffer, 0 dropped
    Received 88 broadcasts, 0 runts, 0 giants
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 abort
    4397061 packets output, 6677621895 bytes, 0 underruns , 0 dropped
    0 output errors, 0 collisions, 0 interface resets
```

```
11-S5750-2#show interfaces gigabitethernet 0/1
Index(dec):1 (hex):1
GigabitEthernet 0/1 is DOWN, line protocol is DOWN
Hardware is Broadcom 5464 GigabitEthernet
Interface address is: no ip address
  MTU 1500 bytes, BW 1000000 Kbit
  Encapsulation protocol is Bridge, loopback not set
  Keepalive interval is 10 sec , set
  Carrier delay is 2 sec
  Rxload is 1/255, Txload is 1/255
  Switchport attributes:
    interface's description:""
    admin medium-type is Copper, oper medium-type is Copper
    lastchange time: 0 Day: 0 Hour:22 Minute: 7 Second
    current status duration: 0 Day: 0 Hour:29 Minute:33 Second
    Priority is 0
    admin duplex mode is AUTO, oper duplex is Unknown
    admin speed is AUTO, oper speed is Unknown
    flow control admin status is OFF, flow control oper status is Unknown
    admin negotiation mode is OFF, oper negotiation state is ON
    Storm Control: Broadcast is ON, Multicast is OFF, Unicast is ON
  5 minutes input rate 0 bits/sec, 0 packets/sec
  5 minutes output rate 0 bits/sec, 0 packets/sec
    4397060 packets input, 6677620405 bytes, 0 no buffer, 0 dropped
    Received 151 broadcasts, 0 runts, 0 giants
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 abort
    3515912 packets output, 236702197 bytes, 0 underruns , 0 dropped
    0 output errors, 0 collisions, 0 interface resets
```

（7）查看端口状态：show interfaces status。

Gi0/1 关闭，Gi0/2 打开

```
11-S5750-1#show interfaces status
Interface                      Status   Vlan  Duplex   Speed     Type
------------------------------ -------- ----  -------  --------- ------
GigabitEthernet 0/1            down     1     Unknown  Unknown   copper
GigabitEthernet 0/2            up       1     Full     1000M     copper
GigabitEthernet 0/3            down     1     Unknown  Unknown   copper
GigabitEthernet 0/4            down     1     Unknown  Unknown   copper
GigabitEthernet 0/5            up       10    Full     1000M     copper
GigabitEthernet 0/6            down     1     Unknown  Unknown   copper
GigabitEthernet 0/7            down     1     Unknown  Unknown   copper
GigabitEthernet 0/8            down     1     Unknown  Unknown   copper
GigabitEthernet 0/9            down     1     Unknown  Unknown   copper
GigabitEthernet 0/10           down     1     Unknown  Unknown   copper
GigabitEthernet 0/11           down     1     Unknown  Unknown   copper
GigabitEthernet 0/12           down     1     Unknown  Unknown   copper
GigabitEthernet 0/13           down     1     Unknown  Unknown   copper
GigabitEthernet 0/14           down     1     Unknown  Unknown   copper
GigabitEthernet 0/15           down     1     Unknown  Unknown   copper
GigabitEthernet 0/16           down     1     Unknown  Unknown   copper
GigabitEthernet 0/17           down     1     Unknown  Unknown   copper
GigabitEthernet 0/18           down     1     Unknown  Unknown   copper
GigabitEthernet 0/19           down     1     Unknown  Unknown   copper
GigabitEthernet 0/20           down     1     Unknown  Unknown   copper
GigabitEthernet 0/21           down     1     Unknown  Unknown   copper
GigabitEthernet 0/22           down     1     Unknown  Unknown   copper
GigabitEthernet 0/23           down     1     Unknown  Unknown   copper
GigabitEthernet 0/24           down     1     Unknown  Unknown   copper
GigabitEthernet 0/25           down     1     Unknown  Unknown   fiber
GigabitEthernet 0/26           down     1     Unknown  Unknown   fiber
GigabitEthernet 0/27           down     1     Unknown  Unknown   fiber
GigabitEthernet 0/28           down     1     Unknown  Unknown   fiber
AggregatePort 1                up       1     Full     1000M     copper
```

```
11-S5750-2#show interfaces status
Interface                      Status   Vlan  Duplex   Speed     Type
------------------------------ -------- ----  -------  --------- ------
GigabitEthernet 0/1            down     1     Unknown  Unknown   copper
GigabitEthernet 0/2            up       1     Full     1000M     copper
GigabitEthernet 0/3            down     1     Unknown  Unknown   copper
GigabitEthernet 0/4            down     1     Unknown  Unknown   copper
GigabitEthernet 0/5            up       10    Full     1000M     copper
GigabitEthernet 0/6            down     1     Unknown  Unknown   copper
GigabitEthernet 0/7            down     1     Unknown  Unknown   copper
GigabitEthernet 0/8            down     1     Unknown  Unknown   copper
GigabitEthernet 0/9            down     1     Unknown  Unknown   copper
GigabitEthernet 0/10           down     1     Unknown  Unknown   copper
GigabitEthernet 0/11           down     1     Unknown  Unknown   copper
GigabitEthernet 0/12           down     1     Unknown  Unknown   copper
GigabitEthernet 0/13           down     1     Unknown  Unknown   copper
GigabitEthernet 0/14           down     1     Unknown  Unknown   copper
GigabitEthernet 0/15           down     1     Unknown  Unknown   copper
GigabitEthernet 0/16           down     1     Unknown  Unknown   copper
GigabitEthernet 0/17           down     1     Unknown  Unknown   copper
GigabitEthernet 0/18           down     1     Unknown  Unknown   copper
GigabitEthernet 0/19           down     1     Unknown  Unknown   copper
GigabitEthernet 0/20           down     1     Unknown  Unknown   copper
GigabitEthernet 0/21           down     1     Unknown  Unknown   copper
GigabitEthernet 0/22           down     1     Unknown  Unknown   copper
GigabitEthernet 0/23           down     1     Unknown  Unknown   copper
GigabitEthernet 0/24           down     1     Unknown  Unknown   copper
GigabitEthernet 0/25           down     1     Unknown  Unknown   fiber
GigabitEthernet 0/26           down     1     Unknown  Unknown   fiber
GigabitEthernet 0/27           down     1     Unknown  Unknown   fiber
GigabitEthernet 0/28           down     1     Unknown  Unknown   fiber
AggregatePort 1                up       1     Full     1000M     copper
```

（8）查看成员端口的速率流量

Gi0/1 关闭，Gi0/2 打开

```
11-S5750-1(config)#show interfaces counters rate
Interface    Sampling Time         Input Rate          Input Rate          Output Rate         Output Rate
                                   (bits/sec)          (packets/sec)       (bits/sec)          (packets/sec)
------------ -------------------- ------------------- ------------------- ------------------- -------------
Gi0/1        5 seconds            0                   0                   0                   0
Gi0/2        5 seconds            1589                0                   1548                0
Gi0/3        5 seconds            0                   0                   0                   0
Gi0/4        5 seconds            0                   0                   0                   0
Gi0/5        5 seconds            1475                0                   1611                0
Gi0/6        5 seconds            0                   0                   0                   0
Gi0/7        5 seconds            0                   0                   0                   0
Gi0/8        5 seconds            0                   0                   0                   0
Gi0/9        5 seconds            0                   0                   0                   0
Gi0/10       5 seconds            0                   0                   0                   0
Gi0/11       5 seconds            0                   0                   0                   0
Gi0/12       5 seconds            0                   0                   0                   0
Gi0/13       5 seconds            0                   0                   0                   0
Gi0/14       5 seconds            0                   0                   0                   0
Gi0/15       5 seconds            0                   0                   0                   0
Gi0/16       5 seconds            0                   0                   0                   0
Gi0/17       5 seconds            0                   0                   0                   0
Gi0/18       5 seconds            0                   0                   0                   0
Gi0/19       5 seconds            0                   0                   0                   0
Gi0/20       5 seconds            0                   0                   0                   0
Gi0/21       5 seconds            0                   0                   0                   0
Gi0/22       5 seconds            0                   0                   0                   0
Gi0/23       5 seconds            0                   0                   0                   0
Gi0/24       5 seconds            0                   0                   0                   0
Gi0/25       5 seconds            0                   0                   0                   0
Gi0/26       5 seconds            0                   0                   0                   0
Gi0/27       5 seconds            0                   0                   0                   0
Gi0/28       5 seconds            0                   0                   0                   0
Ag1          5 seconds            1756                0                   1676                0
```

```
11-S5750-2(config)#show interfaces counters rate
Interface    Sampling Time         Input Rate          Input Rate          Output Rate         Output Rate
                                   (bits/sec)          (packets/sec)       (bits/sec)          (packets/sec)
------------ -------------------- ------------------- ------------------- ------------------- ----------------
----
Gi0/1        5 seconds             0                   0                   0                   0

Gi0/2        5 seconds             1795                0                   1674                0

Gi0/3        5 seconds             0                   0                   0                   0

Gi0/4        5 seconds             0                   0                   0                   0

Gi0/5        5 seconds             1581                0                   1844                0

Gi0/6        5 seconds             0                   0                   0                   0

Gi0/7        5 seconds             0                   0                   0                   0

Gi0/8        5 seconds             0                   0                   0                   0

Gi0/9        5 seconds             0                   0                   0                   0

Gi0/10       5 seconds             0                   0                   0                   0

Gi0/11       5 seconds             0                   0                   0                   0

Gi0/12       5 seconds             0                   0                   0                   0

Gi0/13       5 seconds             0                   0                   0                   0

Gi0/14       5 seconds             0                   0                   0                   0

Gi0/15       5 seconds             0                   0                   0                   0

Gi0/16       5 seconds             0                   0                   0                   0

Gi0/17       5 seconds             0                   0                   0                   0

Gi0/18       5 seconds             0                   0                   0                   0

Gi0/19       5 seconds             0                   0                   0                   0

Gi0/20       5 seconds             0                   0                   0                   0

Gi0/21       5 seconds             0                   0                   0                   0

Gi0/22       5 seconds             0                   0                   0                   0
Gi0/23       5 seconds             0                   0                   0                   0
Gi0/24       5 seconds             0                   0                   0                   0
Gi0/25       5 seconds             0                   0                   0                   0
Gi0/26       5 seconds             0                   0                   0                   0
Gi0/27       5 seconds             0                   0                   0                   0
Gi0/28       5 seconds             0                   0                   0                   0
Ag1          5 seconds             1617                0                   1618                0
```

实验总结：

1、深入理解了链路聚合的配置和原理，并对其技术原理有了更深入的了解。

2、通过将多个物理端口连接起来，将其聚合成一条逻辑链路，从而增加链路带宽和解决网络瓶颈问题，提高网络性能和可靠性，同时实现链路冗余备份。

3、了解了配置端口聚合的具体步骤和相关命令，以及验证和测试的方法。