华为路由与交换配置命令

说明：

1.本文档没有目录，本文档在发布时为 pdf 文档，有章节书签，可以下载到本地来查看，点击书签进入相应的章节。

2.蓝色的字为配置命令，绿色的字为命令的注释，有时命令太密集时，就不用蓝色标出了。

3.本文档仅为配置命令，相关的理论知识请参考其他文档。

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0.安装华为 eNSP 模拟器

首先，到华为官网下载 **eNSP 模拟器**的安装包，然后在安装 eNSP 之前，要先安装三个依赖软件：

WinPcap

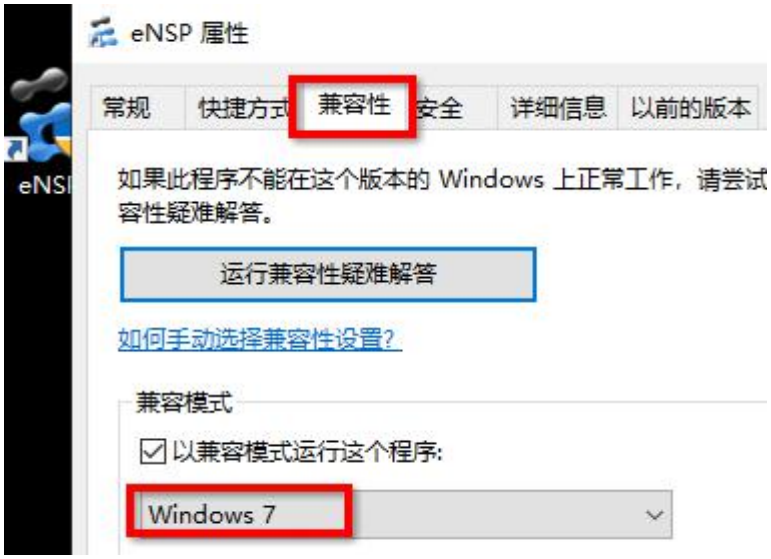
Wireshark

Oracle VM VirtualBox

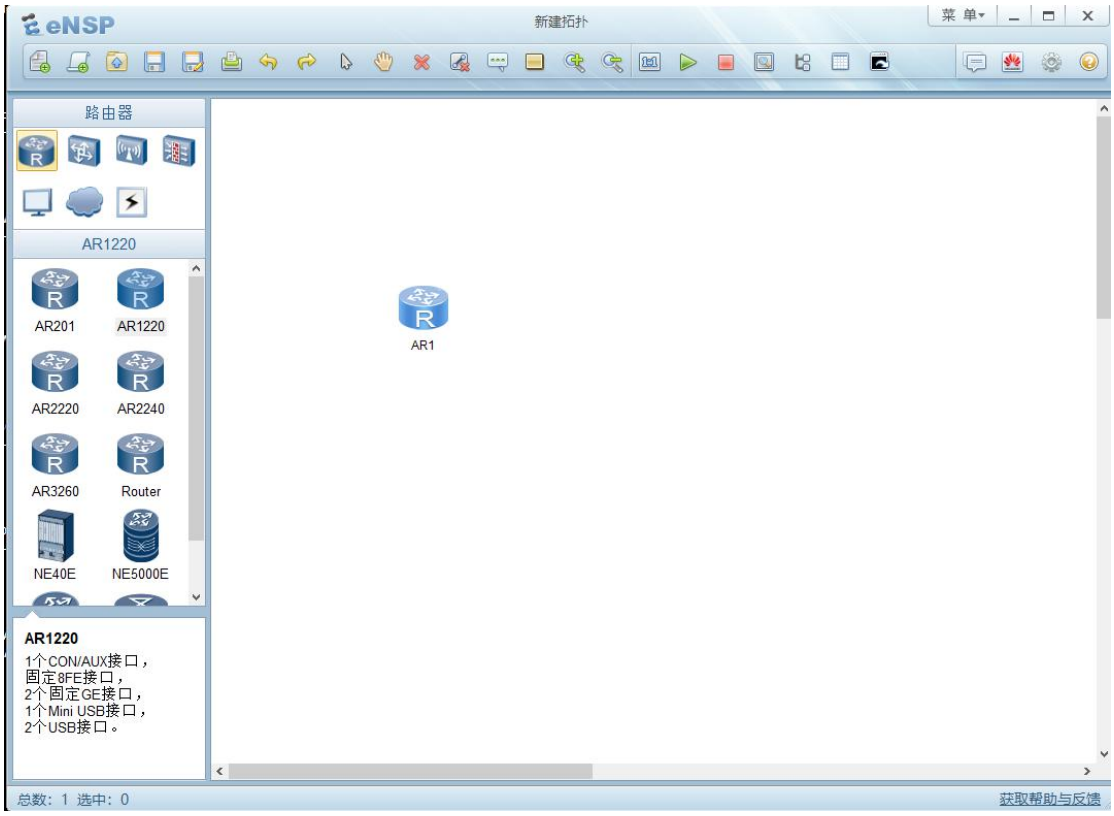
所以一共是要准备 4 个软件包，如果找不到下载的资源，可以联系作者：sysyear@163.com

安装的过程就不多介绍了，装好 eNSP 模拟器后，找到它的图标：

点击右键，设置属性，将其兼容性改为 Windows7，确定。这一步很重要，有时路由器不能正常启动就是因为没有以 win7 的兼容性来运行程序。



然后再双击图标，运行软件。



上图为 eNSP 的主界面，可以在左边拖入路由器或交换机等设备，放到右边的工作区里。然后右击选择启动，再双击设备的图标就可以进入命令行了。具体的用法这里也不介绍了本教程主要是教配置命令

如果有实体硬件设备，那最好是用真实的设备去测试。注意：不要在生产环境中做测试!!

1.设备登录管理

带内管理（console 本地登录）

①配置成仅用密码登录 console

```
<Huawei>                                    //刚开始进入的是一般配置模式
<Huawei>system-view                         //在一般模式下输入 system-view 进入配置模式
Enter system view, return user view with Ctrl+Z.
[Huawei]user-interface console 0                          //对 console 接口的配置
[Huawei-ui-console0]authentication-mode password          //验证模式为仅密码
Please configure the login password (maximum length 16):123456      //如果是路由器，则
                                            //要求立即输入密码，交换机则没有这一步
[Huawei-ui-console0]user privilege level 15     //设置 console 登录的权限级别
                                            //15 为管理员级别
[Huawei-ui-console0]set authentication password cipher 12pass6   //如果是交换机则要配这条
                                                  //表示密码为 12pass6
[Huawei-ui-console0]
```

②使用 用户名和密码登录

```
[Huawei]user-interface console 0
[Huawei-ui-console0]authentication-mode aaa             //使用 aaa 认证登录，需要配置 aaa
[Huawei-ui-console0]
```

带外管理（远程登录）

①Telnet 仅密码登录

```
[Huawei]telnet server enable                //开启 telnet 服务
 Error: TELNET server has been enabled
[Huawei]user-interface vty 0 4              //进入 vty 接口配置
[Huawei-ui-vty0-4]authentication-mode password          //验证模式为仅密码
Please configure the login password (maximum length 16):12xx56      //如果是路由器，则
                                            //要求立即输入密码，交换机则没有这一步
[Huawei-ui-vty0-4]user privilege level 15
[Huawei-ui-vty0-4]set authentication password cipher 12xx56      //如果是交换机要配这条
[Huawei-ui-vty0-4]
```

②Telnet 用户名和密码登录

```
[Huawei-ui-vty0-4]user-interface vty 0 4
[Huawei-ui-vty0-4]authentication-mode aaa
[Huawei-ui-vty0-4]protocol inbound telnet        //允许 telnet 登录
[Huawei-ui-vty0-4]
```

③SSH 用户名和密码登录

```
[Huawei]rsa local-key-pair create           //创建 rsa 密钥
The key name will be: Host
% RSA keys defined for Host already exist.
```

```
Confirm to replace them? (y/n)[n]:y                    //输入 y 确定
The range of public key size is (512 ~ 2048).
NOTES: If the key modulus is greater than 512,
        It will take a few minutes.
Input the bits in the modulus[default = 512]:2048      //推荐用 2048 位的密钥
Generating keys...
.....+++
.....+++
.....++++++++
.....++++++++
[Huawei]user-interface vty 0 4
[Huawei-ui-vty0-4]authentication-mode aaa
[Huawei-ui-vty0-4]protocol inbound ssh                 //允许 ssh 登录如果要允许 telnet 和 ssh 都能
                                                       //登录，则只能设置为 protocol inbound all
[Huawei-ui-vty0-4]quit
[Huawei]ssh user admin authentication-type password    //指定 ssh 用户，但该用户还未创建
Error: Username does not exist
    先到下一章节创建一个帐号吧
    创建好了再回来：
[Huawei]ssh user admin authentication-type password    //指定 ssh 登录用户为 admin
 Authentication type setted, and will be in effect next time
[Huawei]stelnet server enable                          //开启 ssh 服务
Info: Succeeded in starting the STELNET server.
[Huawei]
```

2.保存配置

```
[Huawei]
[Huawei]quit
<Huawei>save                          //配置完毕一定要记得保存配置，在一般模式下保存
  The current configuration will be written to the device.
  Are you sure to continue? (y/n)[n]:y                 //输入 y 确定
  It will take several minutes to save configuration file, please wait.....
  Configuration file had been saved successfully
  Note: The configuration file will take effect after being activated
<Huawei>
```

3.创建用户

```
[Huawei]aaa                                    //进入 aaa 配置界面
[Huawei-aaa]local-user admin password cipher xxx          //创建用户 admin 密码为 xxx
[Huawei-aaa]local-user admin privilege level 15           //用户权限级别为 15,管理员级别
[Huawei-aaa]local-user admin service-type telnet terminal ssh        //用户的服务类型
                                                          //telnet, terminal, ssh 登录用户
[Huawei-aaa]

[Huawei]aaa
[Huawei-aaa]undo local-user cof                //删除帐号
[Huawei-aaa]
[Huawei-aaa]local-user cof state block         //锁定帐号，锁定后该帐号无法再使用
[Huawei-aaa]
[Huawei-aaa]local-user cof state active        //解锁帐号，解锁后该帐号又可以使用了
[Huawei-aaa]
```

4.设置系统时间

```
[Huawei]undo ntp-service enable                          //不使用 ntp
  Info:Stop the NTP service successfully
[Huawei]quit
<Huawei>clock timezone cst add 08:00:00                  //先配置时区，时区名称可自定义
<Huawei>clock datetime 17:55:00 2019-11-29               //配置时间
<Huawei>
<Huawei>dis clock                                        //查看时间
2019-11-29 17:55:04
Friday
Time Zone(cst) : UTC+08:00
<Huawei>
```

5.登录超时设置

```
[Huawei]
[Huawei]user-interface vty 0 4
[Huawei-ui-vty0-4]idle-timeout 15              //空闲 15 分钟则自动登出
[Huawei-ui-vty0-4]
```

6.关闭终端 console 信息输出

<Huawei>undo terminal monitor
Info: Current terminal monitor is off.
<Huawei>

7.启动文件选择

<Huawei>startup saved-configuration vrpcfg.zip　　//指定启动时使用的配置文件
This operation will take several minutes, please wait....
Info: Succeeded in setting the file for booting system
<Huawei>startup system-software xxxxxx.cc　　//指定启动时使用的系统镜像文件

8.SSH 客户端

[Huawei]
[Huawei]ssh client first-time enable　　//初次使用 stelnet 客户端要初始化客户端的密钥
[Huawei]stelnet 10.1.1.1　　//使用 stelnet 远程登录到 10.1.1.1
Please input the username:admin　　//输入用户名
Trying 10.1.1.1 ...
Press CTRL+K to abort
Connected to 10.1.1.1 ...
The server is not authenticated. Continue to access it? [Y/N] :y　　//确认
Save the server's public key? [Y/N] :y　　//确认
The server's public key will be saved with the name 10.1.1.1. Please wait...

Enter password:　　//输入密码
Info: The max number of VTY users is 5, and the number
　　of current VTY users on line is 1.
　　The current login time is 2019-12-03 09:41:47.
<S5700>　　//远程登录成功
<S5700>

9.查看接口状态

<Huawei>dis ip int brief　　//查看接口的 up/down 状态及接口上的 ip
*down: administratively down
^down: standby
(l): loopback

(s): spoofing
The number of interface that is UP in Physical is 2
The number of interface that is DOWN in Physical is 2
The number of interface that is UP in Protocol is 2
The number of interface that is DOWN in Protocol is 2

Interface	IP Address/Mask	Physical	Protocol
GigabitEthernet0/0/0	unassigned	down	down
GigabitEthernet0/0/1	10.1.1.2/24	up	up
GigabitEthernet0/0/2	unassigned	down	down
NULL0	unassigned	up	up(s)

<Huawei>

10.恢复出厂

```
<Huawei>reset saved-configuration                    //重置配置文件
Warning: The action will delete the saved configuration in the device.
The configuration will be erased to reconfigure. Continue? [Y/N]:y     //确定清除配置
Warning: Now clearing the configuration in the device.
Info: Succeeded in clearing the configuration in the device.
<Huawei>reboot                 //配置文件重置后，得重启系统才恢复出厂的运行状态
Info: The system is now comparing the configuration, please wait.
Warning: All the configuration will be saved to the configuration file for the n
ext startup:, Continue?[Y/N]:n              //这里问是否要保存配置，不保存
Info: If want to reboot with saving diagnostic information, input 'N' and then e
xecute 'reboot save diagnostic-information'.
System will reboot! Continue?[Y/N]:y          //确定要重启
<Huawei>########
```

11. TFTP 客户端

```
[Huawei]tftp client-source -a 10.1.1.1          //指定 tftp 客户端的源 ip
Info: Succeeded in setting the source address of the TFTP client to 10.1.1.1.
[Huawei]quit
<Huawei>tftp 10.1.1.254 put vrpcfg.zip s5700_cfg.zip        //上传配置文件 vrpcfg.zip 到 tftp
                                                  //服务器 10.1.1.254，存储文件名为 s5700_cfg.zip
Info: Transfer file in binary mode.
Uploading the file to the remote TFTP server. Please wait...
```

12. FTP 服务器

把交换机或路由器当作 FTP 服务器

```
[Huawei]ftp server enable                    //开启 ftp 服务器
Info: Succeeded in starting the FTP server.
[Huawei]aaa                          //进入 aaa 配置模式
[Huawei-aaa]local-user cof password cipher 12xx56          //创建用户 cof 作为 ftp 用户
Info: Add a new user.
[Huawei-aaa]local-user cof service-type ftp                //用户仅用户 ftp 服务
[Huawei-aaa]local-user cof ftp-directory flash:/           //用户的 ftp 家目录为 flash:/
[Huawei-aaa]quit
[Huawei]
```

13. FTP 客户端

```
<Huawei>ftp -a 10.1.1.2    10.1.1.1            //指定源 ip 为 10.1.1.2,服务器 ip 为 10.1.1.1
Trying 10.1.1.1 ...
Press CTRL+K to abort
Connected to 10.1.1.1.
220 FTP service ready.
User(10.1.1.1:(none)):cof                  //输入 ftp 用户名
331 Password required for cof.
Enter password:                            //输入密码
230 User logged in.                      //成功登录

[Huawei-ftp]dir                            //查看文件列表
200 Port command okay.
150 Opening ASCII mode data connection for *.
drwxrwxrwx      1 noone       nogroup              0 Aug 06    2015 src
drwxrwxrwx      1 noone       nogroup              0 Dec 03 09:22 compatible
-rwxrwxrwx      1 noone       nogroup            538 Dec 03 09:31 vrpcfg.zip
226 Transfer complete.
FTP: 194 byte(s) received in 0.160 second(s) 1.21Kbyte(s)/sec.

[Huawei-ftp]get vrpcfg.zip    s5700.zip              //下载文件，上传为 put xx xxx
200 Port command okay.
150 Opening ASCII mode data connection for vrpcfg.zip.
226 Transfer complete.
FTP: 538 byte(s) received in 0.150 second(s) 3.58Kbyte(s)/sec.
[Huawei-ftp]quit
221 Server closing.
```

14. VLAN 操作

```
[Huawei]vlan 10                                  //创建 vlan 10
[Huawei-vlan10]description kefu                  //描述
[Huawei-vlan10]quit
[Huawei]
[Huawei]vlan batch 100 101 102                   //批量创建 vlan
Info: This operation may take a few seconds. Please wait for a moment...done.
[Huawei]
[Huawei]vlan batch 20 to 30                      //批量创建 vlan
Info: This operation may take a few seconds. Please wait for a moment...done.
[Huawei]
[Huawei]dis vlan summary                         //查看 vlan 汇总情况
static vlan:
Total 16 static vlan.
   1 10 20 to 30 100 to 102

[Huawei]vlan 10
[Huawei-vlan10]management-vlan                   //设置 vlan10 为管理 vlan，
                                                 //管理 vlan 不能添加端口
[Huawei-vlan10]quit
[Huawei]int vlanif 10                    //创建 SVI 接口
[Huawei-Vlanif10]ip address 10.18.1.1 255.255.255.0      //配置 ip
[Huawei-Vlanif10]quit

[Huawei]int GigabitEthernet 0/0/5
[Huawei-GigabitEthernet0/0/5]port link-type access       //设置端口类型为 access
[Huawei-GigabitEthernet0/0/5]port default vlan 20        //将端口加入 vlan20
[Huawei-GigabitEthernet0/0/5]quit
[Huawei]

[Huawei]interface GigabitEthernet 0/0/1
[Huawei-GigabitEthernet0/0/1]port link-type trunk        //设置端口为 trunk 口
[Huawei-GigabitEthernet0/0/1]port trunk pvid vlan 1      //native vlan 为 1
[Huawei-GigabitEthernet0/0/1]port trunk allow-pass vlan all     //华为的 trunk 口默认
                                                                //只允许 vlan1 通过，
[Huawei-GigabitEthernet0/0/1]quit
[Huawei]
```

15. 端口操作

```
[Huawei]int g0/0/3
[Huawei-GigabitEthernet0/0/3]undo negotiation auto      //手动指定端口参数时要先
                                                        //关闭自协商
[Huawei-GigabitEthernet0/0/3]duplex full                //信道模式为全双工
[Huawei-GigabitEthernet0/0/3]speed 1000                 //速率为 1000M
[Huawei-GigabitEthernet0/0/3]combo-port copper          //光电复用口指定为电口
```

16. DDM 检测

```
[Huawei]dis transceiver interface g0/0/1          //显示电口的光功率等信息
```

17.端口聚合

```
[Huawei]int Eth-Trunk 1             //创建聚合口 1
[Huawei-Eth-Trunk1]quit
[Huawei]int g0/0/20
[Huawei-GigabitEthernet0/0/20]eth-trunk 1           //将 g0/0/20 指定为聚合口 1 的成员端口
Info: This operation may take a few seconds. Please wait for a moment...done.
[Huawei-GigabitEthernet0/0/20]quit
[Huawei]int g0/0/21
[Huawei-GigabitEthernet0/0/21]eth-trunk 1           //将 g0/0/21 指定为聚合口 1 的成员端口
Info: This operation may take a few seconds. Please wait for a moment...done.
[Huawei-GigabitEthernet0/0/21]quit
[Huawei]
[Huawei]int eth-trunk 1
[Huawei-Eth-Trunk1]port link-type trunk         //聚合口指定为 trunk，也可为 access
[Huawei-Eth-Trunk1]port trunk allow-pass vlan all
[Huawei-Eth-Trunk1]load-balance src-dst-ip      //负载均衡模式
[Huawei-Eth-Trunk1]
```

18.端口安全

端口安全是对进入端口的 mac 地址进行过滤

```
[Huawei]int g0/0/9
[Huawei-GigabitEthernet0/0/9]port-security enable          //开启端口安全
[Huawei-GigabitEthernet0/0/9]port-security protect-action protect          //保护模式
[Huawei-GigabitEthernet0/0/9]port-security max-mac-num 10          //最多允许 10 个 mac 地址
[Huawei-GigabitEthernet0/0/9]port-security mac-address sticky          //sticky 模式
[Huawei-GigabitEthernet0/0/9]port-security mac-address sticky 0026-ab03-9f04 vlan 1
                                    //手工添加一条 mac 地址
[Huawei-GigabitEthernet0/0/9]
```

19.端口环路检测

```
[Huawei]loopback-detect packet-interval 20          //检测周期，20 秒检测一次
[Huawei]int g0/0/10
[Huawei-GigabitEthernet0/0/10]loopback-detect recovery-time 180          //恢复时间 180 秒
[Huawei-GigabitEthernet0/0/10]loopback-detect enable          //在端口上开启
[Huawei-GigabitEthernet0/0/10]loopback-detect action shutdown          //惩戒动作
[Huawei-GigabitEthernet0/0/10]quit
[Huawei]
[Huawei]loopback-detect enable          //在全局上开启，所有端口都开启
```

20. STP/RSTP

```
[Huawei]stp enable
[Huawei]stp mode stp                    //stp 模式为 STP，也可为 rstp,mstp
Info: This operation may take a few seconds. Please wait for a moment...done.
[Huawei]stp root primary                //指定为根桥
[Huawei]stp priority 4096               //设置桥优先级，必须为 4096 的倍数
[Huawei]dis stp brief                   //查看 stp 基本情况
 MSTID   Port                        Role  STP State     Protection
   0     GigabitEthernet0/0/1        DESI  FORWARDING    NONE
   0     GigabitEthernet0/0/3        DESI  FORWARDING    NONE

[Huawei]int g0/0/3
[Huawei-GigabitEthernet0/0/3]stp port priority 16          //设置端口的优先级，16 的倍数
```

[Huawei-GigabitEthernet0/0/3]stp cost 20000 //端口开销
[Huawei-GigabitEthernet0/0/3]

STP 端口开销表：

端口速率	802.1D 旧版	802.1D/1998 开销	802.1T/2001 开销
10M	100	100	2,000,000
100M	10	19	200,000
1G	1	4	20,000
10G	1	2	2,000

21. MSTP

```
[Huawei]stp enable
[Huawei]stp mode mstp
[Huawei]stp region-configuration              //进入 mstp 配置模式
[Huawei-mst-region]region-name mstp1          //设置 mstp 域名为 mstp1
[Huawei-mst-region]revision-level 1           //设置修定级别为 1
[Huawei-mst-region]instance 1 vlan 1 to 3     //实例与 vlan 绑定
[Huawei-mst-region]instance 2 vlan 9 to 11
[Huawei-mst-region]active region-configuration        //激活 mstp 域配置
Info: This operation may take a few seconds. Please wait for a moment...done.
[Huawei-mst-region]

[Huawei]stp instance 1 priority 4096          //设置本交换机的实例 1 的桥优先级
[Huawei]stp instance 0 root primary           //将本交换机指定为实例 0 的根
[Huawei]dis stp region-configuration          //查看 mstp 域配置
  Oper configuration
    Format selector       :0
    Region name           :mstp1
    Revision level        :1
    Instance      VLANs Mapped
        0           4 to 8, 12 to 4094
        1           1 to 3
        2           9 to 11
[Huawei]

[Huawei]int g0/0/2
[Huawei-GigabitEthernet0/0/2]stp edged-port enable      //设置为边缘端口
[Huawei-GigabitEthernet0/0/2]quit
[Huawei]int g0/0/3
[Huawei-GigabitEthernet0/0/3]stp loop-protection        //非根桥的上联口开启环路保护
```

```
[Huawei-GigabitEthernet0/0/3]quit
[Huawei]int g0/0/4
[Huawei-GigabitEthernet0/0/4]stp root-protection          //根桥上指定端口保护
[Huawei-GigabitEthernet0/0/4]quit
[Huawei]stp bpdu-protection              //全局下所有边缘端口开启 BPDU 防护
```

22. DHCP

```
[Huawei]dhcp enable                  //开启 dhcp 服务
Info: The operation may take a few seconds. Please wait for a moment.done.
[Huawei]int vlanif 1
[Huawei-Vlanif1]ip addr 10.1.1.1 255.255.255.0        //先配置 vlanif 的 IP
[Huawei-Vlanif1]dhcp select global                    //dhcp 使用本地全局的
[Huawei-Vlanif1]quit
[Huawei]ip pool vlan1                //创建地址池 vlan1
Info:It's successful to create an IP address pool.
[Huawei-ip-pool-vlan1]gateway-list 10.1.1.1        //网关为 10.1.1.1
[Huawei-ip-pool-vlan1]network 10.1.1.0 mask 255.255.255.0     //配置网络
[Huawei-ip-pool-vlan1]excluded-ip-address 10.1.1.2 10.1.1.10   //排除地址，不分配 10.1.1.2~10
[Huawei-ip-pool-vlan1]lease day 5 hour 4 minute 0              //租期为 5 天 4 小时 0 分钟
[Huawei-ip-pool-vlan1]dns-list 10.1.1.20 114.114.114.114       //dns 列表
[Huawei-ip-pool-vlan1]static-bind ip-address 10.1.1.99 mac-address 1418-7709-2fd8
                                                    //给目标 mac 分配固定的 IP 地址
[Huawei-ip-pool-vlan1]quit

[Huawei]dis dhcp statistics          //查看 dhcp 报文收发情况
[Huawei]dis ip pool name vlan1          //查看地址池 vlan1 的信息，IP 分配情况等
  Pool-name          : vlan1
  ... ...
  VPN instance       : --
 ------------------------------------------------------------------------------
           Start               End        Total    Used    Idle(Expired)    Conflict    Disable
 ------------------------------------------------------------------------------
         10.1.1.1          10.1.1.254     253      1          243(0)             0           9
 ------------------------------------------------------------------------------
[Huawei]
<Huawei>reset ip pool name vlan1 ?          //收回分配的 IP 地址，可以是某个范围，也可
  X.X.X.X     Start IP address                //以是全部收回
  all         All IP address
  conflict    Conflict IP address
  expired     Expired IP address
```

used Used IP address

23. DHCP 中继

```
[Huawei]int vlan1
[Huawei-Vlanif1]dhcp select relay              //配置 DHCP 模式为中继
[Huawei-Vlanif1]dhcp relay server-ip 10.2.2.33          //配置中继服务器
```

24. DHCP 保存地址分配信息

```
[Huawei]dhcp server database enable          //开启保存地址分配信息的服务
Info: The operation may take a few seconds, please wait.
done.
[Huawei]dhcp server database recover         //使用单一文件保存
[Huawei]dhcp server database write-delay 300          //每分配一个地址后延迟 300 秒再保存
[Huawei]dis dhcp server database                    //查看 database 信息
  Status: enable
  Recover from files after reboot: enable
  File saving lease items: flash:/dhcp/lease.txt          //分配信息保存的文件
  File saving conflict items: flash:/dhcp/conflict.txt      //地址冲突信息保存的文件
  Save Interval: 300 (seconds)
[Huawei]
```

25. DHCP Snooping

```
[Huawei]dhcp snooping enable           //开启 dhcp snooping
[Huawei]int g0/0/1
[Huawei-GigabitEthernet0/0/1]dhcp snooping enable       //接口上开启
[Huawei-GigabitEthernet0/0/1]dhcp snooping trusted      //上联口一定要设置为信任口
[Huawei-GigabitEthernet0/0/1]quit
[Huawei]int g0/0/xxx                //所有下联口，接终端机的，都要开启 dhcp snooping
[Huawei-GigabitEthernet0/0/3]dhcp snooping enable
[Huawei-GigabitEthernet0/0/3]quit
[Huawei]vlan 1
[Huawei-vlan1]ip source check user-bind enable       //在 vlan 上应用 ip-mac 绑定过滤策略
                                //只有由交换机分配的 ip 和对应的 mac 包才允许进入
Info: Add permit rule for dynamic snooping bind-table, please wait a minute!done.
[Huawei-vlan1]
```

26. ARP 相关命令

```
<Huawei>dis arp                    //查看 ARP 表
//IP 地址          MAC 地址      过期时间（分钟）类型      接口       vpn 实例     vlan
IP ADDRESS       MAC ADDRESS     EXPIRE(M) TYPE INTERFACE        VPN-INSTANCE
                                                                 VLAN
--------------------------------------------------------------------------------
10.1.1.1         4c1f-ccb2-5fd9             I -    Vlanif1
10.1.1.3         4c1f-cc28-6616  20         D-0    GE0/0/1
                                                    1
10.1.1.2         4c1f-cc6f-0dba  20         D-0    GE0/0/2
                                                    1
--------------------------------------------------------------------------------
Total:3          Dynamic:2       Static:0        Interface:1
<Huawei>
[Huawei]arp static 10.1.1.3 4c1f-cc28-6616        //添加静态 arp 条目
[Huawei]
[Huawei]int vlan 1
[Huawei-Vlanif1]arp-proxy enable        //在 vlan 接口上开启 arp 代理
[Huawei-Vlanif1]
[Huawei]arp gratuitous-arp send enable            //开启免费 arp 功能
[Huawei]arp gratuitous-arp send interval 20       //免费 arp 发包周期为 20 秒
[Huawei]
[Huawei]arp speed-limit source-mac maximum 50     //限制 arp 发包速率为 50 个每秒
[Huawei]arp speed-limit source-mac 4c1f-cc28-6616 maximum 5      //限制指定源 mac 的
                                                                 //arp 发包速率
[Huawei]
[Huawei]int vlan 1
[Huawei-Vlanif1]arp expire-time 180          //设置 arp 老化时间为 180 秒，默认是 20 分钟
[Huawei-Vlanif1]
```

27. MAC 相关命令

```
[Huawei]dis mac-address                  //查看 mac 地址表
MAC address table of slot 0:
--------------------------------------------------------------------------------
MAC Address    VLAN/          PEVLAN CEVLAN Port                Type        LSP/LSR-ID
               VSI/SI                                                       MAC-Tunnel
--------------------------------------------------------------------------------
4c1f-cc28-6616 1                -      -      GE0/0/3           dynamic     0/-
4c1f-cc6f-0dba 1                -      -      GE0/0/2           dynamic     0/-
--------------------------------------------------------------------------------
```

```
Total matching items on slot 0 displayed = 2
[Huawei]
[Huawei]mac-address aging-time 300          //设置 mac 老化时间，默认为 300 秒
[Huawei]mac-address static 4c1f-cc28-6616 g0/0/3 vlan 1          //添加静态 mac 条目
[Huawei]
[Huawei]mac-address blackhole 4c1f-cc28-992f vlan 1              //黑洞 mac
[Huawei]
```

28.广播抑制

```
[Huawei]int g0/0/3
[Huawei-GigabitEthernet0/0/3]storm-control interval 180          //惩戒时间 180 秒
[Huawei-GigabitEthernet0/0/3]storm-control action block          //惩戒动作为阻塞
[Huawei-GigabitEthernet0/0/3]storm-control enable log            //开启日志
[Huawei-GigabitEthernet0/0/3]storm-control broadcast min-rate 1000 max-rate 1200
                                    //广播包速率限制为 1000 pts 最大允许 1200  包每秒
[Huawei-GigabitEthernet0/0/3]
```

29. Qos 限速策略

```
[Huawei]traffic classifier class1           //定义流类
[Huawei-classifier-class1]if-match any        //匹配数据，可以是所有数据，也可用 acl 限定
[Huawei-classifier-class1]quit
[Huawei]traffic behavior behav1          //定义流行为
[Huawei-behavior-behav1]car cir 1000 cbs 150000 pbs 200000        //单位:Kbit/s, byte/s,byte/s
[Huawei-behavior-behav1]quit
[Huawei]traffic policy policy1           //定义流策略
[Huawei-trafficpolicy-policy1]classifier class1 behavior behav1   //策略使用的流类及流行为
[Huawei-trafficpolicy-policy1]quit
[Huawei]
[Huawei]int g0/0/3
[Huawei-GigabitEthernet0/0/3]traffic-policy policy1 inbound      //在接口上使用策略
[Huawei-GigabitEthernet0/0/3]traffic-policy policy1 outbound         //2 个方向上都可应用
[Huawei-GigabitEthernet0/0/3]quit
<Huawei>dis traffic-policy applied-record policy1       //查看策略的应用情况
----------------------------------------------------
  Policy Name:      policy1
```

```
  Policy Index:    2
       Classifier:class1          Behavior:behav1
-----------------------------------------------
 *interface GigabitEthernet0/0/3
      traffic-policy policy1 inbound
        slot 0       :    success
 *interface GigabitEthernet0/0/3
      traffic-policy policy1 outbound
        slot 0       :    success
-----------------------------------------------
  Policy total applied times: 2.
<Huawei>
```

30. ACL 访问控制列表

acl number	类型	匹配对象
2000~2999	基本 acl	源 ip
3000~3999	扩展 acl	源 ip，目的 ip，tcp/udp 的源 port，目的 port，IP 上层协议号
4000~4999	二层 acl	mac 地址，vlanID

默认最后有一条 permit any，记得必要时请在末尾一条 rule 添加 deny any

```
[Huawei]acl number 2000          //创建基本 acl
[Huawei-acl-basic-2000]rule 1 permit source 10.1.1.0 0.0.0.255       //匹配源网段，反掩码
[Huawei-acl-basic-2000]rule 10 permit source 10.1.2.22 0             //匹配源 ip，掩码为 0
[Huawei-acl-basic-2000]quit
[Huawei]acl number 3000          //创建扩展 acl
[Huawei-acl-adv-3000]rule 1 permit ip source 10.1.1.0 0.0.0.255 destination
                        10.18.0.0   0.0.255.255          //ip 地址只能用反掩码
[Huawei-acl-adv-3000]rule 5 permit tcp source 10.0.0.0 0.255.255.255 source-port
                        eq 40 destination any destination-port range 10   99
[Huawei-acl-adv-3000]quit
[Huawei]acl number 4000          //创建二层 acl
[Huawei-acl-L2-4000]rule 1 permit source-mac 4c1f-cc28-6616 ffff-ffff-ffff       //匹配 mac
                        destination-mac 4c1f-cc28-6617 ffff-ffff-ffff       //使用正掩码
[Huawei-acl-L2-4000]quit
[Huawei]int g0/0/9
[Huawei-GigabitEthernet0/0/9]traffic-filter inbound acl 2000          //应用 acl 到接口上
[Huawei-GigabitEthernet0/0/9]quit
```

ACL 时间

```
[Huawei]time-range time1 from 18:00 2019/12/04 to 23:00 2019/12/06       //匹配一段时间
```

```
[Huawei]time-range time2 10:00 to 15:30 daily              //匹配一个周期，每天的某个时段
[Huawei]time-range time3 15:00 to 19:30 ?              //也可以是指定的星期几
  <0-6>            Day of the week(0 is Sunday)
  Fri              Friday
  Mon              Monday
  Sat              Saturday
  Sun              Sunday
  Thu              Thursday
  Tue              Tuesday
  Wed              Wednesday
  daily            Every day of the week
  off-day          Saturday and Sunday
  working-day      Monday to Friday
```

31.端口镜像

```
[Huawei]observe-port 1 int g0/0/3       //观察口，被镜像的数据流向此端口
[Huawei]int g0/0/2
[Huawei-GigabitEthernet0/0/2]port-mirroring to observe-port 1 both
                //设置端口为被镜像口，镜像的数据为 both（包含 inbound 和 outbound）
[Huawei-GigabitEthernet0/0/2]quit
[Huawei]
[Huawei]dis port-mirroring          //查看端口镜像情况
  Port-mirror:
  ------------------------------------------------------------------------
  Mirror-port                    Direction        Observe-port
  ------------------------------------------------------------------------
  GigabitEthernet0/0/2           Both             GigabitEthernet0/0/3
  ------------------------------------------------------------------------
[Huawei]
```

32. IP 和 MAC 绑定（可绑定到端口上）

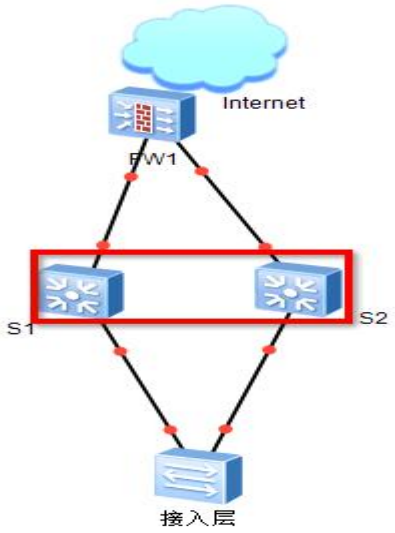
```
[Huawei]user-bind static ip-address 10.1.1.92 mac-address 4c1f-cc6f-0f33    [int g0/0/3]
Info: 1 static user-bind item(s) added.              //添加一条静态的 ip 和 mac 绑定条目
[Huawei]vlan 1
[Huawei-vlan1]ip source check user-bind enable       //在相应 vlan 上开启 ip-mac 检查
[Huawei-vlan1]quit
```

33. SNMP

[Huawei]snmp-agent　　//开启 snmp 代理功能
[Huawei]snmp-agent community read public123 acl 2002　　//可用 acl 指定允许的管理站
[Huawei]snmp-agent sys-info version all　　//指定 snmp 版本，v1, v2c, v3, all
[Huawei]snmp-agent sys-info location XXbuilding
[Huawei]snmp-agent sys-info contact coflee-18912345678
[Huawei]snmp-agent trap enable　　//开启 trap 功能
Warning: All switches of SNMP trap/notification will be open. Continue? [Y/N]:y
[Huawei]snmp-agent target-host trap address udp-domain 10.1.1.252 udp-port 162
params securityname prtgxx v2c
//设置 trap 参数，管理主机 ip,trap 端口号，团体字及版本

34. VRRP（要配合 mstp）

VRRP 只有 advertisment 报文，报文传播使用组播地址 224.0.0.18，报文封装在 IP 报文中，上层协议号为 118，Virtual Router 的 mac 地址为 0000-5E00-01-vrid
优先级默认为 100，越大越优先



拓扑如上图
S1（10.10.1.1）和 S2（10.10.1.2）虚拟成一个网关（10.10.1.254）vlan10
S1 上的配置如下（S2 上的配置省略）
[Huawei]vrrp virtual-ip ping enable　　//允许 ping 虚拟网关，必须在配置 vrrp 之前开启
[Huawei]int vlan 10
[Huawei-Vlanif10]ip add 10.10.1.1 255.255.255.0
[Huawei-Vlanif10]vrrp vrid 10 virtual-ip 10.10.1.254　　//虚拟网关 ip
[Huawei-Vlanif10]vrrp vrid 10 priority 120　　//优先级为 120，目的是让其成为 master

```
[Huawei-Vlanif10]vrrp vrid 10 track int g0/0/24 reduced 30
                                    //如果上联口断了则降低优先级，减 30，变成备份的
[Huawei-Vlanif10]vrrp vrid 10 preempt-mode timer delay 5      //抢占延迟时间设为 5 秒
[Huawei-Vlanif10]vrrp vrid 10 preempt-mode disable        //或者 关闭抢占模式
[Huawei-Vlanif10]quit
[Huawei]vrrp gratuitous-arp timeout 30            //设置 vrrp 的免费 arp 发送周期，30 秒

[Huawei]dis vrrp brief                //查看 vrrp 信息
VRID   State          Interface                Type       Virtual IP
------------------------------------------------------------------------------
10     Initialize     Vlanif10                 Normal     10.10.1.254
------------------------------------------------------------------------------
Total:1        Master:0        Backup:0        Non-active:1
[Huawei]
```

35.静态路由配置

```
[Huawei]ip route-static 10.19.0.0 255.255.0.0 10.1.1.2 preference 30      //配置静态路由
[Huawei]
[Huawei]dis ip routing-table              //查看路由表
Route Flags: R - relay, D - download to fib
------------------------------------------------------------------------------
Routing Tables: Public
         Destinations : 5        Routes : 5
Destination/Mask    Proto   Pre  Cost      Flags NextHop         Interface
        10.1.1.0/24  Direct  0    0           D   10.1.1.1        Vlanif1
        10.1.1.1/32  Direct  0    0           D   127.0.0.1       Vlanif1
       10.19.0.0/16  Static  30   0          RD   10.1.1.2        Vlanif1
        127.0.0.0/8  Direct  0    0           D   127.0.0.1       InLoopBack0
        127.0.0.1/32 Direct  0    0           D   127.0.0.1       InLoopBack0
```

36.单臂路由

```
[Huawei]int g0/0/2.10
[Huawei-GigabitEthernet0/0/2.10]dot1q termination vid 10
[Huawei-GigabitEthernet0/0/2.10]ip add 192.168.10.254 255.255.255.0
[Huawei-GigabitEthernet0/0/2.10]arp broadcast enable
```

```
[Huawei-GigabitEthernet0/0/2.10]quit
[Huawei]int g0/0/2.20
[Huawei-GigabitEthernet0/0/2.20]dot1q termination vid 20
[Huawei-GigabitEthernet0/0/2.20]ip add 192.168.20.254 255.255.255.0
[Huawei-GigabitEthernet0/0/2.20]arp broadcast enable
[Huawei-GigabitEthernet0/0/2.20]quit
[Huawei]
```

37.黑洞路由

```
[Huawei]ip route-static 10.0.0.0 255.0.0.0 NULL 0
```

38. RIP

```
[Huawei]rip 1                    //开启 rip 进程 1
[Huawei-rip-1]version 2          //版本为 v2
[Huawei-rip-1]undo summary       //关闭路由自动汇总
[Huawei-rip-1]preference 50      //设置路由优先级
[Huawei-rip-1]network 10.0.0.0   //宣告网段
[Huawei-rip-1]import-route ospf 1 cost 5      //路由引入（重分布）
[Huawei-rip-1]default-route originate cost 2  //引入默认路由（0.0.0.0）
[Huawei-rip-1]silent-interface g0/0/2         //rip 进程里指定 静默接口
[Huawei-rip-1]quit
[Huawei]int g0/0/1
[Huawei-GigabitEthernet0/0/1]rip authentication-mode md5 nonstandard plain xxxx   1
                                 //设置 rip 端口验证
```

39. OSPF

```
[Huawei]ospf router-id 10.1.1.252 1          //开启 ospf 进程 1，同时指定 router-id
Info: The configuration succeeded. You need to restart the OSPF process to valid
ate the new router ID.
[Huawei-ospf-1]
[Huawei-ospf-1]area 0
[Huawei-ospf-1-area-0.0.0.0]network 10.1.1.0 0.0.0.255          //在区域 0 宣告网段
```

```
[Huawei-ospf-1-area-0.0.0.0]quit
[Huawei-ospf-1]area 1
[Huawei-ospf-1-area-0.0.0.1]network 10.2.2.0 0.0.0.255          //在区域 1 宣告网段
[Huawei-ospf-1-area-0.0.0.1]quit
[Huawei-ospf-1]area 0
[Huawei-ospf-1-area-0.0.0.0]authentication-mode md5 1 cipher xxxx      //区域 0 开启区域验证
[Huawei-ospf-1-area-0.0.0.0]quit
[Huawei-ospf-1]import-route rip 1 cost 20000          //路由引入（重分布）
[Huawei-ospf-1]default-route-advertise cost 20000     //引入默认路由（0.0.0.0）
[Huawei-ospf-1]area 1
[Huawei-ospf-1-area-0.0.0.1]vlink-peer 10.2.2.33      //虚链路对端
[Huawei-ospf-1-area-0.0.0.1]quit

[Huawei]dis ospf peer brief          //查看 ospf 邻居及相关信息
[Huawei]dis ospf lsdb          //查看 ospf 链路状态数据库
```

40.策略路由

```
[Huawei]traffic classifier class2          //定义流类
[Huawei-classifier-class2]if-match acl 2000        //匹配 acl，该 acl 匹配目标流量
[Huawei-classifier-class2]quit
[Huawei]traffic behavior behav2          //定义流行为
[Huawei-behavior-behav2]redirect ip-nexthop 10.1.1.1          //指定下一跳
[Huawei-behavior-behav2]quit
[Huawei]traffic policy policy2          //定义流策略
[Huawei-trafficpolicy-policy2]classifier class2 behavior behav2        //匹配相应的类和行为
[Huawei-trafficpolicy-policy2]quit
[Huawei]int g0/0/1
[Huawei-GigabitEthernet0/0/1]traffic-policy policy2 inbound          //在接口上应用策略
[Huawei-GigabitEthernet0/0/1]quit
[Huawei]dis traffic-policy applied-record          //查看策略应用情况
-----------------------------------------------
  Policy Name:      policy2
  Policy Index:    0
      Classifier:class2         Behavior:behav2
-----------------------------------------------
 *interface GigabitEthernet0/0/1
     traffic-policy policy2 inbound
       slot 0       :    success
-----------------------------------------------
```

41. PPP

```
[Huawei]int s4/0/1
[Huawei-Serial4/0/1]virtualbaudrate 2048000          //设置串口波特率
[Huawei-Serial4/0/1]physical-mode async              //串口传输模式设为异步的
[Huawei-Serial4/0/1]physical-mode sync               //也可设为同步的（默认是同步的）
[Huawei-Serial4/0/1]link-protocol ppp                //封装协议为 ppp
[Huawei-Serial4/0/1]ppp authentication-mode chap        //ppp 使用 chap
[Huawei-Serial4/0/1]ppp chap user cof                   //ppp 用户名
[Huawei-Serial4/0/1]ppp chap password cipher xxxxx      //ppp 用户密码
[Huawei-Serial4/0/1]quit

[Huawei-Serial4/0/1]ppp authentication-mode pap         //ppp 使用 pap
[Huawei-Serial4/0/1]ppp pap local-user cof password cipher xxxx
[Huawei-Serial4/0/1]quit
```

42. DNS

```
[Huawei]dns resolve            //开启 dns 解析
[Huawei]dns server 8.8.8.8          //设置 dns 服务器
[Huawei]dns proxy enable            //开启 dns 代理
[Huawei]ip host xx.com 10.1.1.33        //添加本地解析项
[Huawei]ip host ff.com 10.1.1.22
[Huawei]
[Huawei]ping xx.com            //测试
  PING xx.com (10.1.1.33): 56    data bytes, press CTRL_C to break
```

43. NAT

①静态 NAT：一对一映射，映射的公网 IP 不可与出接口的 ip 相同

```
[Huawei]int g0/0/1
[Huawei-GigabitEthernet0/0/1]ip add 100.1.1.1 255.255.255.0        //接口配置公网 ip
[Huawei-GigabitEthernet0/0/1]nat server global 100.1.1.2 inside 10.1.1.45      //配置 ip 转换
[Huawei-GigabitEthernet0/0/1]nat static enable              //开启静态 NAT
[Huawei-GigabitEthernet0/0/1]quit
```

②端口复用 PAT

```
[Huawei]acl number 2009
[Huawei-acl-basic-2009]rule 1 permit source 10.1.1.0 0.0.0.255        //acl 匹配内网网段
```

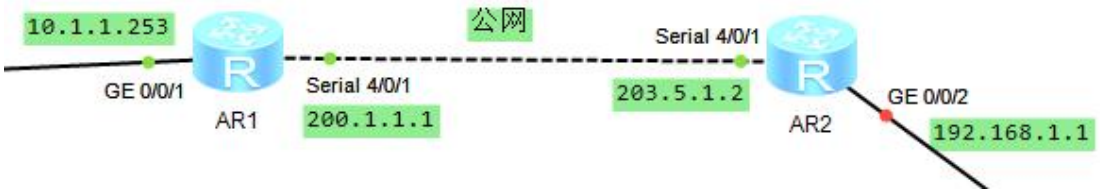
```
[Huawei-acl-basic-2009]quit
[Huawei]int g0/0/1
[Huawei-GigabitEthernet0/0/1]nat outbound 2009          //出接口上应用 nat，
                                                        //内网 ip 转换为出接口的 ip
[Huawei-GigabitEthernet0/0/1]quit
[Huawei]
```

③端口映射

```
[Huawei]int g0/0/1
[Huawei-GigabitEthernet0/0/1]nat static protocol tcp global current-interface 8888
                                    inside 10.1.1.22 80
    //将外网的接口 ip:8888 转为内网的 10.1.1.22:80
[Huawei-GigabitEthernet0/0/1]nat static protocol tcp global 100.1.1.5 9999 inside 10.1.1.35 443
    //将外网的 100.1.1.5:9999 转为内网的 10.1.1.35:443
[Huawei]dis nat session all          //查看 nat 会话情况
```

44. IPsec VPN（站到站）

前提：2 端的路由器都要有去往对端内网网段的路由，且要有缺省路由指向网关。



拓扑图如上，AR1 的内网为 10.1.1.0/24，出接口 ip 为 200.1.1.1，网关 200.1.1.2
AR2 的内网为 192.168.1.0/24，出接口 ip203.5.1.2，网关 203.5.1.3

AR1 上的配置如下：（AR2 的类似）

0.配置出接口 ip 及路由

```
[Huawei]int s4/0/1
[Huawei-Serial4/0/1]ip add 200.1.1.1 255.255.255.0
[Huawei-Serial4/0/1]quit
[Huawei]ip route-static 0.0.0.0 0.0.0.0 200.1.1.2
[Huawei]
```

1.配置 acl 匹配目标流

```
[Huawei]acl num 3000
[Huawei-acl-adv-3000]rule 1 permit ip source 10.1.1.0 0.0.0.255 destination
                                192.168.1.0 0.0.0.255
[Huawei-acl-adv-3000]quit
```

2.配置 ipsec 提议

```
[Huawei]ipsec proposal pro1                    //创建 ipsec 安全提议
[Huawei-ipsec-proposal-pro1]esp authentication-algorithm sha1          //消息摘要算法
[Huawei-ipsec-proposal-pro1]esp encryption-algorithm aes-128           //数据加密算法
[Huawei-ipsec-proposal-pro1]encapsulation-mode tunnel          //使用隧道模式
[Huawei-ipsec-proposal-pro1]quit
```

3.配置 ike 提议

```
[Huawei]ike proposal 5
[Huawei-ike-proposal-5]authentication-algorithm sha1
[Huawei-ike-proposal-5]encryption-algorithm aes-cbc-128
[Huawei-ike-proposal-5]authentication-method pre-share
```

4.配置 ike 对端

```
[Huawei]ike peer peer1 v1
[Huawei-ike-peer-peer1]pre-shared-key cipher xxxx
[Huawei-ike-peer-peer1]remote-address 203.5.1.2
[Huawei-ike-peer-peer1]ike-proposal 5
[Huawei-ike-peer-peer1]quit
```

5.配置 ipsec 策略

```
[Huawei]ipsec policy ipsecp1 10 isakmp
[Huawei-ipsec-policy-isakmp-ipsecp1-10]ike-peer peer1
[Huawei-ipsec-policy-isakmp-ipsecp1-10]proposal pro1
[Huawei-ipsec-policy-isakmp-ipsecp1-10]security acl 3000
```

6.出接口上应用 ipsec 策略

```
[Huawei]int s4/0/1
[Huawei-Serial4/0/1]ipsec policy ipsecp1
[Huawei-Serial4/0/1]quit
```

```
[Huawei]dis ike proposal                //查看 ike 提议
[Huawei]dis ipsec proposal              //查看 ipsec 提议
[Huawei]dis ike peer                    //查看 ike 对端
[Huawei]dis ipsec statistics esp        //查看 ipsec 统计情况
```

45. L2TP VPN

1.先添加一个用户，用于 l2tp 拨号的（也可用 radius 验证）

```
[Huawei]aaa
[Huawei-aaa]local-user coflee password cipher xxxx
Info: Add a new user.
[Huawei-aaa]local-user coflee service-type ppp
[Huawei-aaa]quit
```

2.配置拨号后的地址池

[Huawei]ip pool lns

Info: It's successful to create an IP address pool.

[Huawei-ip-pool-lns]network 192.168.33.0 mask 255.255.255.0

[Huawei-ip-pool-lns]gateway-list 192.168.33.1

[Huawei-ip-pool-lns]dns-list 8.8.8.8

[Huawei-ip-pool-lns]quit

3.配置虚拟接口模板

[Huawei]int Virtual-Template 1

Dec 5 2019 11:22:41-08:00 Huawei %%01IFPDT/4/IF_STATE(l)[0]:Interface Virtual-T
emplate1 has turned into UP state.

[Huawei-Virtual-Template1]ip add 192.168.33.1 255.255.255.0

[Huawei-Virtual-Template1]ppp authentication chap

[Huawei-Virtual-Template1]remote address pool lns

[Huawei-Virtual-Template1]quit

[Huawei]

4.配置 l2tp vpn

[Huawei]l2tp enable

[Huawei]l2tp-group 1

[Huawei-l2tp1]tunnel name LNS

[Huawei-l2tp1]undo tunnel authentication

[Huawei-l2tp1]allow l2tp Virtual-Template 1

[Huawei-l2tp1]quit

46. PPPoe 服务器

1.配置虚拟接口模板

[Huawei]int Virtual-Template 2

Dec 5 2019 11:30:10-08:00 Huawei %%01IFPDT/4/IF_STATE(l)[1]:Interface Virtual-T
emplate2 has turned into UP state.

[Huawei-Virtual-Template2]ppp authentication-mode chap call-in domain xxx.com

[Huawei-Virtual-Template2]remote address pool pppoe1

[Huawei-Virtual-Template2]ip address unnumbered interface g0/0/2

[Huawei-Virtual-Template2]quit

2.配置 ip 地址池

[Huawei]ip pool pppoe1

Info: It's successful to create an IP address pool.

[Huawei-ip-pool-pppoe1]network 10.1.1.0 mask 255.255.255.0

[Huawei-ip-pool-pppoe1]gateway-list 10.1.1.1

[Huawei-ip-pool-pppoe1]dns-list 8.8.8.8

[Huawei-ip-pool-pppoe1]quit

3.配置用户认证（使用 radius）

```
[Huawei]radius-server template rds            //创建 radius-server 模板
Info: Create a new server template.
[Huawei-radius-rds]radius-server shared-key cipher xxxx
[Huawei-radius-rds]radius-server authentication 10.1.1.99 1645       //指定验证服务器及端口
[Huawei-radius-rds]radius-server accounting 10.1.1.99 1645           //指定计费服务器及端口
[Huawei-radius-rds]quit
[Huawei]aaa
[Huawei-aaa]authentication-scheme rdsAuth             //创建验证方案
Info: Create a new authentication scheme.
[Huawei-aaa-authen-rdsAuth]authentication-mode radius        //验证模式用 radius
[Huawei-aaa-authen-rdsAuth]quit
[Huawei-aaa]accounting-scheme rdsAcct                 //创建计费方案
Info: Create a new accounting scheme.
[Huawei-aaa-accounting-rdsAcct]accounting-mode radius
[Huawei-aaa-accounting-rdsAcct]quit
[Huawei-aaa]domain xxx.com                    //创建域
Info: Success to create a new domain.
[Huawei-aaa-domain-xxx.com]authentication-scheme rdsAuth
[Huawei-aaa-domain-xxx.com]accounting-scheme rdsAcct
[Huawei-aaa-domain-xxx.com]radius-server rds
[Huawei-aaa-domain-xxx.com]quit
[Huawei-aaa]quit
[Huawei]
[Huawei]domain xxx.com admin          //指定该域为默认的，缺省的域，当用户拨号时若
          //不指定域名，则缺省为该域，然后使用该域的验证方案和计费方案，即 radius
```

4.接口上应用

```
[Huawei]int g0/0/2
[Huawei-GigabitEthernet0/0/2]pppoe-server bind virtual-template 2
[Huawei-GigabitEthernet0/0/2]mtu 1492          //因为 pppoe 报文占 8 字节开销
[Huawei-GigabitEthernet0/0/2]quit

[Huawei]dis pppoe-server session all          //查看 pppoe 会话情况
```

47. PPPoe 客户端

```
[Huawei]int Dialer 1            //创建拨号接口 1
Dec  5 2019 11:46:45-08:00 Huawei %%01IFPDT/4/IF_STATE(l)[2]:Interface Dialer1 h
as turned into UP state.
```

```
[Huawei-Dialer1]link-potocol ppp
[Huawei-Dialer1]ppp chap user cof
[Huawei-Dialer1]ppp chap password cipher xxx
[Huawei-Dialer1]ip address ppp-negotiate
[Huawei-Dialer1]dialer user cof          //该用户名同 ppp 用户
[Huawei-Dialer1]dialer bundle 1
[Huawei-Dialer1]dialer timer idle 300
INFO:    The configuration will become effective after link reset.
[Huawei-Dialer1]dialer-group 1
[Huawei-Dialer1]quit
[Huawei]int g0/0/1
[Huawei-GigabitEthernet0/0/1]pppoe-client dial-bundle-number 1
                                  //出接口上配置为 pppoe 拨号
[Huawei-GigabitEthernet0/0/1]quit
[Huawei]ip route-static 0.0.0.0 0.0.0.0 Dialer 1          //缺省路由下一跳指向拨号接口 1
```

48. NQA（network quality analysis）

```
[Huawei]nqa test-instance admin isp1              //创建 nqa 探测实例 isp1
[Huawei-nqa-admin-isp1]test-type icmp
[Huawei-nqa-admin-isp1]destination-address ipv4 200.1.1.2          //探测目标 ip
[Huawei-nqa-admin-isp1]frequency 20       //每 20 秒探测一次
[Huawei-nqa-admin-isp1]probe-count 2      //每次发 2 个 icmp 包
[Huawei-nqa-admin-isp1]interval seconds 4       //每个 icmp 包时间间隔为 4 秒
[Huawei-nqa-admin-isp1]timeout 2                //ping 超时 2 秒
[Huawei-nqa-admin-isp1]start now                //立即启动 nqa 探测
[Huawei-nqa-admin-isp1]undo start               //关闭 nqa
[Huawei-nqa-admin-isp1]start now
[Huawei-nqa-admin-isp1]quit
[Huawei]dis nqa results                  //查看 nqa 结果
[Huawei]dis nqa history                  //查看 nqa 历史情况
```

nqa一般可以应用在缺省路由和路由策略上，相关的命令如下：

```
[Huawei]ip route-static 0.0.0.0 0.0.0.0 10.1.1.2 track nqa admin isp1  //isp1 为 nqa 实例
[Huawei]ip route-static 0.0.0.0 0.0.0.0 20.1.1.2 track nqa admin isp2  //isp2 为 nqa 实例
     //当 nqa 检测到某个网关 ping 不通时，就会联动通知路由器取消某条路由或策略
[Huawei]traffic behavior be1
[Huawei-behavior-be1]redirect ip-nexthop 10.1.1.2 track nqa admin isp1
[Huawei-behavior-be1]quit
[Huawei]traffic behavior be2
[Huawei-behavior-be2]redirect ip-nexthop 20.1.1.2 track nqa admin isp2
[Huawei-behavior-be2]quit
```

49.恢复密码（保留原配置）

1.开机或重启设备时，出现字符提示时立即按下 Ctrl 键和 B 键，进入 BootRom 模式
2.输入 BootRom 密码：
　　一般为 Admin@huawei.com　　,或者是 huawei　或者是 9300
3.进入 BootRom 后，根据提示输入 7 （清除 console 密码），yes 确定。
4.再输入 1（以默认模式进入系统），不要选择 8（重启），不然还是要密码。
5.以默认模式进入系统后，不要求输入密码，这时我们可以重新配置管理员密码，保存即可。

end