组建二层直连式无线网络

难度（最高五星）：★★★★ 建议学时：3学时

目录

实验说明

任务描述

二层是指AP和AC之间是二层组网，三层是指AC和AP之间是三层组网；二层组网AP可以通过二层广播，或者DHCP过程，即插即用上线；三层网络下，AP无法直接发现AC，需要通过DHCP或DNS方式动态发现，或者配置静态IP。

在实际组网中，一台AC可以连接几十甚至几百台AP，组网一般比较复杂。比如在企业网络中，AP可以布放在办公室，会议室，会客间等场所，而AC可以安放在公司机房。这样，AP和AC之间的网络就是比较复杂的三层网络。因此，在大型组网中一般采用三层组网。

本任务是学习二层组网，完成本任务，学生会对WLAN有一个清晰的了解，通过配置完成WLAN的二层组网。

学习目标

完成本任务的学习后，你应当能：

1. 掌握配置 WLAN 的命令
2. 掌握 AC 配置的方法
3. 掌握认证 AP 上线的配置方法
4. 理解各种无线配置模板
5. 掌握 WLAN 配置的基本流程
6. 掌握 WLAN 业务参数的配置思路

任务准备

网络拓扑

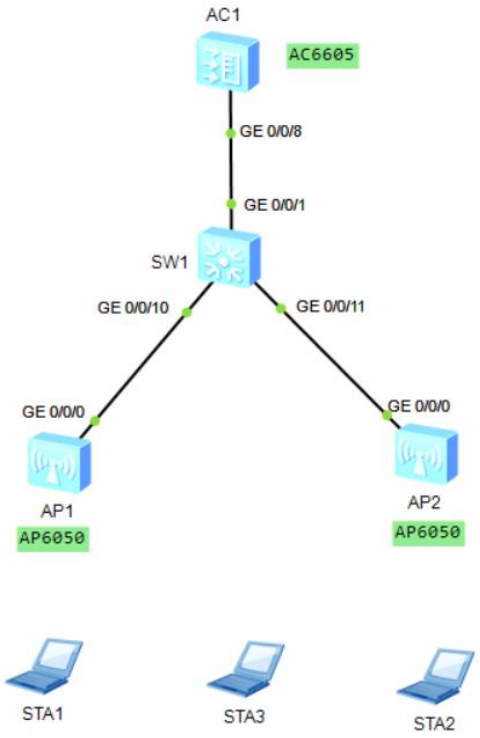

图1 WLAN二层直连式无线组网实验拓扑

初始配置

- SW1的初始配置

```
<Huawei>system-view
Enter system view, return user view with Ctrl+Z.
[Huawei]sysname SW1
[SW1]
```

- AC的初始配置

```
<AC6605>system-view
Enter system view, return user view with Ctrl+Z.
[AC6605]sysname AC
[AC]
```

任务实施

1 查看基础配置

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2 配置交换机

1) 配置接入交换机SW1。将接口GE0/0/10和GE0/0/11加入VLAN10（管理VLAN，连接AP），设置其PVID为VLAN10，将接口GE0/0/1加入VLAN10～VLAN13（连接AC）。

```
[SW1] vlan batch 10 to 13
Info: This operation may take a few seconds. Please wait for a moment...done.
[SW1]
[SW1] interface GigabitEthernet0/0/10
[SW1-GigabitEthernet0/0/10] port link-type trunk
[SW1-GigabitEthernet0/0/10] port trunk pvid vlan 10
[SW1-GigabitEthernet0/0/10] port trunk allow-pass vlan 10 to 13
[SW1-GigabitEthernet0/0/10] quit
[SW1]
[SW1] interface GigabitEthernet0/0/11
[SW1-GigabitEthernet0/0/11] port link-type trunk
[SW1-GigabitEthernet0/0/11] port trunk pvid vlan 10
[SW1-GigabitEthernet0/0/11] port trunk allow-pass vlan 10 to 13
[SW1-GigabitEthernet0/0/11] quit
[SW1]
[SW1] interface GigabitEthernet 0/0/1
[SW1-GigabitEthernet0/0/1] port link-type trunk
[SW1-GigabitEthernet0/0/1] port trunk allow-pass vlan 10 to 13
[SW1-GigabitEthernet0/0/1] quit
[SW1]
```

2) 在交换机SW1上创建Loopback 1接口，设置其地址为“101.101.101.101”。创建各VLANIF接口，作为各业务VLAN的网关。

```
[SW1] interface LoopBack 1
[SW1-LoopBack1] ip address 101.101.101.101 32
[SW1-LoopBack1] quit
[SW1] interface Vlanif 10
[SW1-Vlanif10] ip address 10.1.10.1 24
[SW1-Vlanif10] quit
```

```
[SW1]
[SW1] interface Vlanif 11
[SW1-Vlanif11] ip address 10.1.11.1 24
[SW1-Vlanif11] quit
[SW1]
[SW1] interface Vlanif 12
[SW1-Vlanif12] ip address 10.1.12.1 24
[SW1-Vlanif12] quit
[SW1]
[SW1] interface Vlanif 13
[SW1-Vlanif13] ip address 10.1.13.1 24
[SW1-Vlanif13] quit
[SW1]
```

3 配置 AC 基础信息

1) 创建VLAN10~VLAN13

```
[AC]vlan batch 10 to 13
Info: This operation may take a few seconds. Please wait for a moment...done.
[AC]
```

2) 配置GE0/0/8接口用来连接交换机SW1。

```
[AC]interface g0/0/8
[AC-GigabitEthernet0/0/8]port link-type trunk
[AC-GigabitEthernet0/0/8]port trunk allow-pass vlan 10 to 13
[AC-GigabitEthernet0/0/8]quit
[AC]
```

3) 配置完成后使用display port vlan来检查配置是否正确。

```
[AC]display port vlan
Port                      Link Type    PVID  Trunk VLAN List
--------------------------------------------------------------------------------
GigabitEthernet0/0/1        hybrid       1     -
GigabitEthernet0/0/2        hybrid       1     -
GigabitEthernet0/0/3        hybrid       1     -
GigabitEthernet0/0/4        hybrid       1     -
GigabitEthernet0/0/5        hybrid       1     -
GigabitEthernet0/0/6        hybrid       1     -
GigabitEthernet0/0/7        hybrid       1     -
GigabitEthernet0/0/8        trunk        1     1  10-13
```

```
GigabitEthernet0/0/9        hybrid      1     -
GigabitEthernet0/0/10       hybrid      1     -
GigabitEthernet0/0/11       hybrid      1     -
GigabitEthernet0/0/12       hybrid      1     -
GigabitEthernet0/0/13       hybrid      1     -
GigabitEthernet0/0/14       hybrid      1     -
GigabitEthernet0/0/15       hybrid      1     -
GigabitEthernet0/0/16       hybrid      1     -
GigabitEthernet0/0/17       hybrid      1     -
GigabitEthernet0/0/18       hybrid      1     -
GigabitEthernet0/0/19       hybrid      1     -
GigabitEthernet0/0/20       hybrid      1     -
GigabitEthernet0/0/21       hybrid      1     -
GigabitEthernet0/0/22       hybrid      1     -
GigabitEthernet0/0/23       hybrid      1     -
GigabitEthernet0/0/24       hybrid      1     -
XGigabitEthernet0/0/1       hybrid      1     -
XGigabitEthernet0/0/2       hybrid      1     -
```

4) 配置VLAN相应的三层接口IP地址

```
[AC]interface Vlanif 10
[AC-Vlanif10]ip address 10.1.10.100 24
[AC-Vlanif10]quit
[AC]
[AC]interface Vlanif 11
[AC-Vlanif11]ip address 10.1.11.100 24
[AC-Vlanif11]quit
[AC]
[AC]interface Vlanif 12
[AC-Vlanif12]ip address 10.1.12.100 24
[AC-Vlanif12]quit
[AC]
[AC]interface Vlanif 13
[AC-Vlanif13]ip address 10.1.13.100 24
[AC-Vlanif13]quit
[AC]
```

5) 检查配置

- 检查配置的接口是否已经变为UP状态。

```
[AC]display ip interface brief
*down: administratively down
^down: standby
(l): loopback
(s): spoofing
(E): E-Trunk down
The number of interface that is UP in Physical is 5
The number of interface that is DOWN in Physical is 1
The number of interface that is UP in Protocol is 5
The number of interface that is DOWN in Protocol is 1

Interface                         IP Address/Mask      Physical   Protocol
MEth0/0/1                         unassigned           down       down
NULL0                             unassigned           up         up(s)
Vlanif10                          10.1.10.100/24       up         up
Vlanif11                          10.1.11.100/24       up         up
Vlanif12                          10.1.12.100/24       up         up
Vlanif13                          10.1.13.100/24       up         up
```

- 检查AC和三层交换机模拟公网地址的路由是否可达，注意此时ping 101.101.101.101（交换机上的模拟公网的接口）不可达。

在AC配置静态默认路由指向交换机。

```
[AC]ip route-static 0.0.0.0 0.0.0.0 10.1.10.1
```

此时再ping 101.101.101.101已经可达。

```
[AC]ping 101.101.101.101
  PING 101.101.101.101: 56  data bytes, press CTRL_C to break
    Reply from 101.101.101.101: bytes=56 Sequence=1 ttl=254 time=1 ms
    Reply from 101.101.101.101: bytes=56 Sequence=2 ttl=254 time=1 ms
    Reply from 101.101.101.101: bytes=56 Sequence=3 ttl=254 time=1 ms
    Reply from 101.101.101.101: bytes=56 Sequence=4 ttl=254 time=1 ms
    Reply from 101.101.101.101: bytes=56 Sequence=5 ttl=254 time=1 ms

  --- 101.101.101.101 ping statistics ---
    5 packet(s) transmitted
    5 packet(s) received
    0.00% packet loss
    round-trip min/avg/max = 1/1/1 ms
```

4 创建 AP 组

创建名ap-group1的AP组。

```
[AC]wlan
[AC-wlan-view]ap-group name ap-group1
Info: This operation may take a few seconds. Please wait for a moment.done.
[AC-wlan-ap-group-ap-group1]quit
[AC-wlan-view]quit
[AC]
```

5 配置 AP 上线

1) AC上开启DHCP服务，为STA和AP分配IP地址。AP地址池里配置option 43选项。

```
[AC]dhcp enable
Info: The operation may take a few seconds. Please wait for a moment.done.
[AC]
[AC]ip pool ap
Info: It is successful to create an IP address pool.
[AC-ip-pool-ap]network 10.1.10.0 mask 24
[AC-ip-pool-ap]gateway-list 10.1.10.1
[AC-ip-pool-ap]option 43 sub-option 3 ascii 10.1.10.100
[AC-ip-pool-ap]quit
[AC]
[AC]ip pool employee
Info: It is successful to create an IP address pool.
[AC-ip-pool-employee]network 10.1.11.0 mask 24
[AC-ip-pool-employee]gateway-list 10.1.11.1
[AC-ip-pool-employee]quit
[AC]
[AC]ip pool voice
Info: It is successful to create an IP address pool.
[AC-ip-pool-voice]network 10.1.12.0 mask 24
[AC-ip-pool-voice]gateway-list 10.1.12.1
[AC-ip-pool-voice]quit
[AC]
[AC]ip pool guest
Info: It is successful to create an IP address pool.
```

```
[AC-ip-pool-guest]network 10.1.13.0 mask 24
[AC-ip-pool-guest]gateway-list 10.1.13.1
[AC-ip-pool-guest]quit
[AC]
```

2) 分别在AC上的各VLANIF接口下使能DHCP功能。

```
[AC]interface Vlanif 10
[AC-Vlanif10]dhcp select global
[AC-Vlanif10]quit
[AC]
[AC]interface Vlanif 11
[AC-Vlanif11]dhcp select global
[AC-Vlanif11]quit
[AC]
[AC]interface Vlanif 12
[AC-Vlanif12]dhcp select global
[AC-Vlanif12]quit
[AC]
[AC]interface Vlanif 13
[AC-Vlanif13]dhcp select global
[AC-Vlanif13]quit
[AC]
```

3) 配置名为domain1的域管理模板，在模板下配置AC的国家码。

```
[AC]wlan
[AC-wlan-view]regulatory-domain-profile name domain1
[AC-wlan-regulate-domain-domain1]country-code CN
Info: The current country code is same with the input country code.
[AC-wlan-regulate-domain-domain1]quit
[AC-wlan-view]quit
[AC]
```

4) 配置AC源接口。

```
[AC]capwap source interface vlanif 10
[AC]
```

5) 配置AP认证方式。

AP认证支持三种，默认是MAC认证，需要手工添加AP列表到控制上，如认证方式被修改过，现在要重新改回MAC认证的命令是：

```
[AC]wlan
[AC-wlan-view]ap auth-mode mac-auth
```

```
[AC-wlan-view]
```

6) 离线导入AP

在AC上离线导入AP，将两台AP加入AP组“ap-group1”中。根据AP背后的MAC地址手工添加AP，分别将AP命名为“AP1”和“AP2”。

```
[AC1-wlan-view]ap-mac 00e0-fc8e-1060 ap-id 0 #注意要根据 AP 的实际 MAC 地址进行配置
[AC1-wlan-ap-0]ap-group ap-group1
Warning: This operation may cause AP reset. If the country code changes, it will clear
channel, power and antenna gain configurations of the radio, Whether to continue? [Y/N]:y
[AC1-wlan-ap-0]ap-name ap1
[AC1-wlan-ap-0]quit
[AC1-wlan-view]
[AC1-wlan-view]ap-mac 00e0-fcfb-6250 ap-id 1 #注意要根据 AP 的实际 MAC 地址进行配置
[AC1-wlan-ap-1]ap-group ap-group1
Warning: This operation may cause AP reset. If the country code changes, it will clear
channel, power and antenna gain configurations of the radio, Whether to continue? [Y/N]:y
[AC1-wlan-ap-1]ap-name ap2
[AC1-wlan-ap-1]quit
[AC1-wlan-view]quit
[AC1]
```

7) 观察AP上线

添加完AP后，AP的状态会经历从fault到config到normal的变化，最终会保持在normal状态，如果等几分钟后没有变成该状态，你应该检查前面VLAN和DHCP及AP认证的配置是否有错。

```
[AC]display ap all
Info: This operation may take a few seconds. Please wait for a moment.done.
Total AP information:
nor  : normal          [2]
--------------------------------------------------------------------------------
----------
ID   MAC            Name Group      IP          Type            State STA Uptime
--------------------------------------------------------------------------------
----------
0    00e0-fc8e-1060 ap1  ap-group1 10.1.10.172 AP6050DN        nor   0   1M:16S
1    00e0-fcfb-6250 ap2  ap-group1 10.1.10.178 AP6050DN        nor   0   25S
--------------------------------------------------------------------------------
----------
Total: 2
[AC]
```

6 配置 WLAN 业务参数

1) 配置SSID模板

创建名为“employee1”、“voice1”和“guest1”的SSID模板，并分别配置SSID名称为“employee1”、“voice1”和“guest1”。

```
[AC]wlan
[AC-wlan-view]ssid-profile name employee1
[AC-wlan-ssid-prof-employee1]ssid employee1
Info: This operation may take a few seconds, please wait.done.
[AC-wlan-ssid-prof-employee1]quit
[AC-wlan-view]
[AC-wlan-view]ssid-profile name voice1
[AC-wlan-ssid-prof-voice1]ssid voice1
Info: This operation may take a few seconds, please wait.done.
[AC-wlan-ssid-prof-voice1]quit
[AC-wlan-view]
[AC-wlan-view]ssid-profile name guest1
[AC-wlan-ssid-prof-guest1]ssid guest1
Info: This operation may take a few seconds, please wait.done.
[AC-wlan-ssid-prof-guest1]quit
[AC-wlan-view]quit
[AC]
```

2) 创建VAP模版

创建名为“employee1”、“voice1”和“guest1”的VAP模板，配置“employee1”、“voice1”的业务数据转发模式为直接转发，“guest1” 的业务数据转发模式为隧道转发，配置业务VLAN，并且引用SSID模板。

```
[AC]wlan
[AC-wlan-view]vap-profile name employee1
[AC-wlan-vap-prof-employee1]forward-mode direct-forward
[AC-wlan-vap-prof-employee1]service-vlan vlan-id 11
Info: This operation may take a few seconds, please wait.done.
[AC-wlan-vap-prof-employee1]ssid-profile employee1
Info: This operation may take a few seconds, please wait.done.
[AC-wlan-vap-prof-employee1]quit
[AC-wlan-view]
[AC-wlan-view]vap-profile name voice1
[AC-wlan-vap-prof-voice1]forward-mode direct-forward
```

```
[AC-wlan-vap-prof-voice1]service-vlan vlan-id 12
Info: This operation may take a few seconds, please wait.done.
[AC-wlan-vap-prof-voice1]ssid-profile voice1
Info: This operation may take a few seconds, please wait.done.
[AC-wlan-vap-prof-voice1]quit
[AC-wlan-view]
[AC-wlan-view]vap-profile name guest1
[AC-wlan-vap-prof-guest1]forward-mode tunnel
Info: This operation may take a few seconds, please wait.done.
[AC-wlan-vap-prof-guest1]service-vlan vlan-id 13
Info: This operation may take a few seconds, please wait.done.
[AC-wlan-vap-prof-guest1]ssid-profile guest1
Info: This operation may take a few seconds, please wait.done.
[AC-wlan-vap-prof-guest1]quit
[AC-wlan-view]quit
[AC]
```

3) 管理模板

配置AP组引用域管理模板和VAP模板，AP组“ap-group1”引用VAP模板“employee1”，设置VAP ID为“1”；引用VAP模板“voice1”，设置VAP ID为“2 "，引用VAP模板“guest1”，设置VAP ID为“3"，AP上射频0和射频1都使用VAP模板的配置

```
[AC]wlan
[AC-wlan-view]ap-group name ap-group1
[AC-wlan-ap-group-ap-group1]vap-profile employee1 wlan 1 radio all
Info: This operation may take a few seconds, please wait...done.
[AC-wlan-ap-group-ap-group1]
[AC-wlan-ap-group-ap-group1]vap-profile voice1 wlan 2 radio all
Info: This operation may take a few seconds, please wait...done.
[AC-wlan-ap-group-ap-group1]
[AC-wlan-ap-group-ap-group1]vap-profile guest1 wlan 3 radio all
Info: This operation may take a few seconds, please wait...done.
[AC-wlan-ap-group-ap-group1]
[AC-wlan-ap-group-ap-group1]regulatory-domain-profile domain1
Warning: Modifying the country code will clear channel, power and antenna gain c
onfigurations of the radio and reset the AP. Continue?[Y/N]:
Error: Please choose 'YES' or 'NO' first before pressing 'Enter'. [Y/N]:y
[AC-wlan-ap-group-ap-group1]quit
[AC-wlan-view]quit
[AC]
```

结果验证

1 查看 VAP 状态

WLAN业务配置会自动下发给AP，配置完成后，通过执行命令display vap ssid employee1、display vap ssid voice1和display vap ssid guest1查看如下信息，当“Status”项显示为“ON”时，表示AP对应的射频上的VAP已创建成功。

```
[AC]display vap ssid employee1
Info: This operation may take a few seconds, please wait.
WID : WLAN ID
--------------------------------------------------------------------------------
AP ID AP name RfID WID  BSSID          Status  Auth type  STA   SSID
--------------------------------------------------------------------------------
0     ap1     0    1    00E0-FC8E-1060 ON      Open       0     employee1
0     ap1     1    1    00E0-FC8E-1070 ON      Open       0     employee1
1     ap2     0    1    00E0-FCFB-6250 ON      Open       0     employee1
1     ap2     1    1    00E0-FCFB-6260 ON      Open       0     employee1
--------------------------------------------------------------------------------
Total: 4
[AC]
[AC]display vap ssid voice1
Info: This operation may take a few seconds, please wait.
WID : WLAN ID
--------------------------------------------------------------------------------
AP ID AP name RfID WID  BSSID          Status  Auth type  STA   SSID
--------------------------------------------------------------------------------
0     ap1     0    2    00E0-FC8E-1061 ON      Open       0     voice1
0     ap1     1    2    00E0-FC8E-1071 ON      Open       0     voice1
1     ap2     0    2    00E0-FCFB-6251 ON      Open       0     voice1
1     ap2     1    2    00E0-FCFB-6261 ON      Open       0     voice1
--------------------------------------------------------------------------------
Total: 4
[AC]
[AC]display vap ssid guest1
Info: This operation may take a few seconds, please wait.
WID : WLAN ID
--------------------------------------------------------------------------------
```

```
AP ID AP name RfID WID  BSSID          Status  Auth type  STA   SSID
------------------------------------------------------------------------------
0     ap1     0    3    00E0-FC8E-1062 ON      Open       0     guest1
0     ap1     1    3    00E0-FC8E-1072 ON      Open       0     guest1
1     ap2     0    3    00E0-FCFB-6252 ON      Open       0     guest1
1     ap2     1    3    00E0-FCFB-6262 ON      Open       0     guest1
------------------------------------------------------------------------------
Total: 4
[AC]
```

2 连接无线终端

配置完成后，AP会释放employee1、voice1和guest1三个信号，认证方式为开放模式使用STA关联其中一个无线网络，可以使用display station all查看到关联的相关用户信息。如图2 所示。

```
[AC]display station all
Rf/WLAN: Radio ID/WLAN ID
Rx/Tx: link receive rate/link transmit rate(Mbps)
--------------------------------------------------------------------------------
------------------
STA MAC          AP ID Ap name  Rf/WLAN  Band  Type  Rx/Tx      RSSI  VLAN  IP a
ddress  SSID
--------------------------------------------------------------------------------
------------------
5489-98af-58c2   1     ap2      0/3      2.4G  -     -/-        -     13    10.1
.13.198 guest1
5489-98dd-164b   0     ap1      0/2      2.4G  -     -/-        -     12    10.1
.12.21  voice1
5489-98ee-6ae0   0     ap1      0/1      2.4G  -     -/-        -     11    10.1
.11.231 employee1
--------------------------------------------------------------------------------
------------------
Total: 3 2.4G: 3 5G: 0
[AC]
```

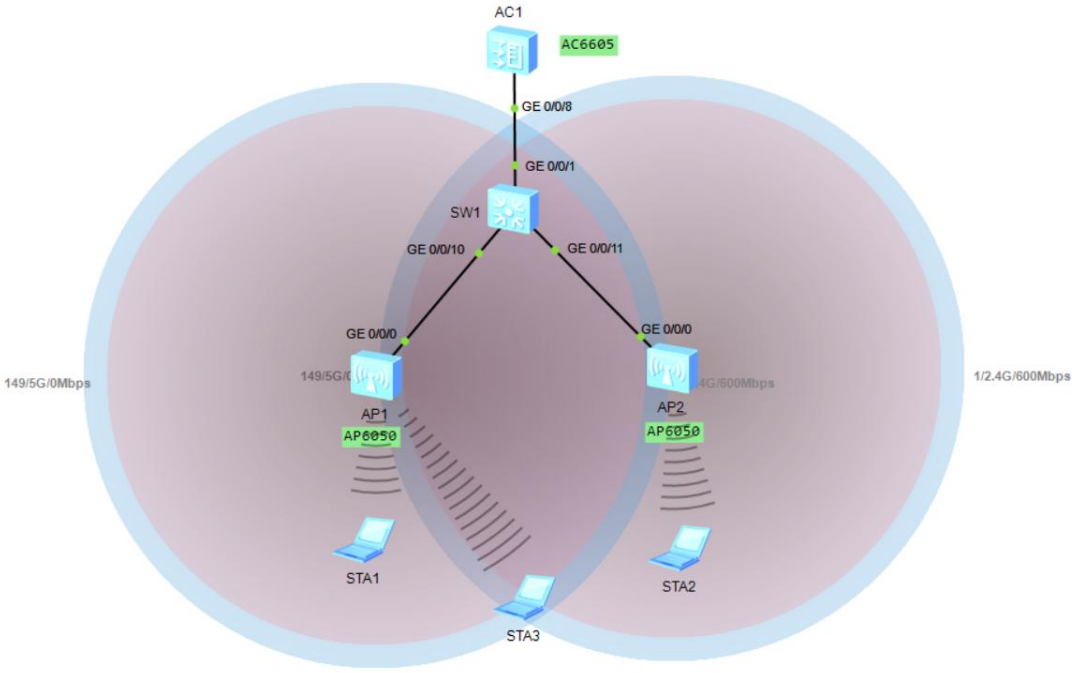

图2 连接的无线终端

3 测试连通性

在无线终端上ping交换机上的模拟公网地址101.101.101.101。

- 链接SSID：employee1

```
STA>ipconfig

Link local IPv6 address...........: ::
IPv6 address.....................: :: / 128
IPv6 gateway.....................: ::
IPv4 address.....................: 10.1.11.231
Subnet mask......................: 255.255.255.0
Gateway..........................: 10.1.11.1
Physical address.................: 54-89-98-EE-6A-E0
DNS server.......................:

STA>ping 101.101.101.101 -c 2

Ping 101.101.101.101: 32 data bytes, Press Ctrl_C to break
From 101.101.101.101: bytes=32 seq=1 ttl=255 time=110 ms
From 101.101.101.101: bytes=32 seq=2 ttl=255 time=125 ms
```

```
--- 101.101.101.101 ping statistics ---
  2 packet(s) transmitted
  2 packet(s) received
  0.00% packet loss
  round-trip min/avg/max = 110/117/125 ms

STA>
```

- 链接SSID：guest1

```
STA>ipconfig

Link local IPv6 address...........: ::
IPv6 address......................: :: / 128
IPv6 gateway......................: ::
IPv4 address......................: 10.1.13.198
Subnet mask.......................: 255.255.255.0
Gateway...........................: 10.1.13.1
Physical address..................: 54-89-98-AF-58-C2
DNS server........................:

STA>ping 101.101.101.101 -c 2

Ping 101.101.101.101: 32 data bytes, Press Ctrl_C to break
From 101.101.101.101: bytes=32 seq=1 ttl=255 time=140 ms
From 101.101.101.101: bytes=32 seq=2 ttl=255 time=141 ms

--- 101.101.101.101 ping statistics ---
  2 packet(s) transmitted
  2 packet(s) received
  0.00% packet loss
  round-trip min/avg/max = 140/140/141 ms

STA>
```

- 链接SSID：voice1

```
STA>ipconfig

Link local IPv6 address...........: ::
```

```
IPv6 address.....................: :: / 128
IPv6 gateway.....................: ::
IPv4 address.....................: 10.1.12.21
Subnet mask......................: 255.255.255.0
Gateway..........................: 10.1.12.1
Physical address.................: 54-89-98-DD-16-4B
DNS server.......................:

STA>ping 101.101.101.101 -c 2

Ping 101.101.101.101: 32 data bytes, Press Ctrl_C to break
From 101.101.101.101: bytes=32 seq=1 ttl=255 time=204 ms
From 101.101.101.101: bytes=32 seq=2 ttl=255 time=188 ms

--- 101.101.101.101 ping statistics ---
  2 packet(s) transmitted
  2 packet(s) received
  0.00% packet loss
  round-trip min/avg/max = 188/196/204 ms

STA>
```