Ruijie Networks – Innovation Beyond Networks

Ruijie WLAN PoC Guide (V1.1)

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Preface

This document providing technical guidance to help engineers testing RG-WLAN products. This document may contain scenario, configuration, command, screenshot image, topology and any related material. This document may not help to solve a similar case due any differences in the real conditions.

Audience

- Network Engineers
- Network Administrator

Obtain Technical Assistance

- Ruijie Networks Websites: http://www.ruijienetworks.com
- Ruijie Service Portal: http://caseportal.ruijienetworks.com

Welcome to report error and give advice in any Ruijie manual to Ruijie Service Portal

Revision History

Date	Change contents	Reviser
2019.10	Initial publication V1.0	Nick Chen
2020.08	Initial publication V1.1	Henry Huang

Content

Test Items Summary

Category	Test Item	Description	Pass	Fail
Basic Setup	Central Forwarding	The test AP establishes CAPWAP tunnel with the AC using Central		
	Local Forward	The test AP establishes CAPWAP tunnel with the AC using Local Forwarding mode		
	Fat Mode	AP switches to FAT mode and broadcast SSIDs		
Common Function	Rate Limit	Limit the average data rate and burst data rate to each wireless user connected to the AP		
	Wireless Bridge	A wireless tunnel will be established between 2 APs		
	AP Load Balance	Load balancing based on the number of users		
	Remote Intelligent Perceptive Technology (RIPT)	When the CAPWAP tunnel between AP and AC is down, the AP is still able to transfer user data normally		
	AC Virtualization (VAC)	Multiple ACs will be virtualized into one logical AC		
Security Function	Wireless Encryption (WPA/WPA2)	Wireless user needs to input password when connect to wireless network.		
	Private Pre-Shared Key (PPSK)	Different STAs uses different passwords to connect the same SSID		
	Blacklist & Whitelist	When blacklist is enabled, STAs within the blacklist cannot access the wireless network. When whitelist is enabled, only STAs within the whitelist ca access the wireless network.		
	AP Countermeasure	Ruijie AP interferes with STAs connecting to APs from other vendors		
	User Isolation	Wireless users connect to same AP cannot get access to each other		
	802.1x Authentication	802.1x authentication is required to connect the wireless network		

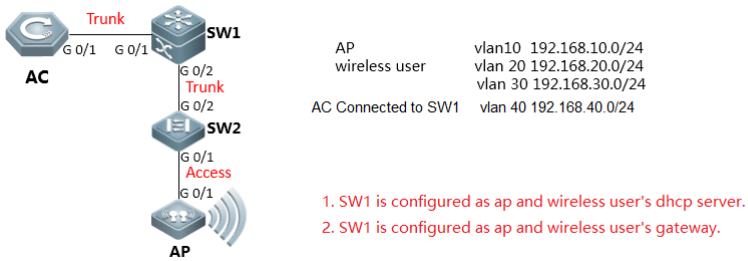
	Web Authentication	Web authentication is required to connect the wireless network		
Performance	AP Throughput Performance	Test the AP's max throughput performance		
	WiFi6 AP Throughput Performance	Test the AP's max throughput performance		
	Multi-Users Throughput Performance	Test the Multi-Users throughput performance		
	Multi-Users video performance	Test the Multi-Users video performance		

Note: Before PoC, please ensure all the test devices have been upgraded to the latest version.

Test Content

1. Basic Setup

1.1 Central Forwarding

Test Item	Central Forwarding
Description	The test AP establishes CAPWAP tunnel with the AC using Central Forwarding mode
Test Procedure	**Topology:**  **Procedure:** 1) Configure AC Step1: config Vlan, include user vlan and interconnect vlan, Ruijie>enable Ruijie#configure terminal Ruijie(config)#vlan 20 **------>user vlan** Ruijie(config-vlan)#name sta Ruijie(config-vlan)#exit Ruijie(config)#vlan 30 **------>user vlan**

```
Ruijie(config-vlan)#name sta
Ruijie(config-vlan)#exit
Ruijie(config)#vlan 40        ------>interconnect vlan for ac and sw1
Ruijie(config-vlan)#exit
Ruijie(config)#interface vlan 20      ------>user interface vlan(must config)
Ruijie(config-int-vlan)#ip add 192.168.20.2 255.255.255.
Ruijie(config)#interface vlan 30      ------>user interface vlan(must config)
Ruijie(config-int-vlan)#ip add 192.168.30.2 255.255.255.0
Ruijie(config-int-vlan)#exit
```

Step2：Config ssid (multi ssid)

```
Ruijie(config)#wlan-config 1    Ruijie1
Ruijie(config-wlan)#enable-broad-ssid            ------->enable broadcast ssid
Ruijie(config-wlan)#exit
Ruijie(config)#wlan-config 2    Ruijie2
Ruijie(config-wlan)#enable-broad-ssid            ------->enable broadcast ssid
Ruijie(config-wlan)#exit
```

Step3：Config ag-group

```
Ruijie(config)#ap-group default
Ruijie(config-ap-group)#interface-mapping 1 20          ------->associate wlan-
config 1 with user vlan 30
Ruijie(config-ap-group)#interface-mapping 2 30           ------->associate
wlan-config 2 with user vlan 30
Ruijie(config-ap-group)#exit
```

Step4：Config svi and routing

```
Ruijie(config)#ip route 0.0.0.0 0.0.0.0 192.168.40.1      ------->default routing
to sw1
Ruijie(config)#interface vlan 40        ------->interconnect vlan with sw1
Ruijie(config-int-vlan)#ip address 192.168.40.2 255.255.255.0
Ruijie(config-int-vlan)#exit
Ruijie(config)#interface loopback 0
Ruijie(config-int-loopback)#ip address 1.1.1.1 255.255.255.0    ------->AC
initialize CAPWAP tunnel setup from loopback 0 interface
Ruijie(config-int-loopback)#exit
Ruijie(config)#interface GigabitEthernet 0/1
Ruijie(config-int-GigabitEthernet 0/1)#switchport mode trunk            ------
->connect to sw1, trunk port, allow user vlan、AP vlan、AC-to-SW1
vlan
```

Step5：Save config

```
Ruijie(config-int-GigabitEthernet 0/1)#end
Ruijie#write
```

2) Configure core switch(SW1)

Step1：Vlan config, config user vlan, ap vlan and interconnect vlan

```
Ruijie>enable
Ruijie#configure terminal
Ruijie(config)#vlan 10        ------>ap vlan
Ruijie(config-vlan)#exit
Ruijie(config)#vlan 20        ------>user vlan
Ruijie(config-vlan)#exit
Ruijie(config)#vlan 30        ------>user vlan
Ruijie(config-vlan)#exit
Ruijie(config)#vlan 40        ------>interconnect vlan with AC
Ruijie(config-vlan)#exit
```

Step2：Config interface and svi

```
Ruijie(config)# interface GigabitEthernet 0/1
Ruijie(config-int-GigabitEthernet 0/1)#switchport mode trunk          ------
->uplink port, connect to AC, trunk port,allow user vlan、AP vlan、AC-
to-SW1 vlan
Ruijie(config-int-GigabitEthernet 0/1)#exit
Ruijie(config)#interface GigabitEthernet 0/2
Ruijie(config-int-GigabitEthernet 0/2)#switchport mode trunk          ------
->downlink port, connect to SW2,trunk port,allow user vlan、AP vlan
Ruijie(config-int-GigabitEthernet 0/2)#exit
Ruijie(config)#interface vlan 10      ------>ap gateway
Ruijie(config-int-vlan)#ip address    192.168.10.1 255.255.255.0
Ruijie(config-int-vlan)#interface vlan 20          ------->sta gateway
Ruijie(config-int-vlan)#ip address 192.168.20.1 255.255.255.0
Ruijie(config-int-vlan)#interface vlan 30          ------->sta gateway
Ruijie(config-int-vlan)#ip address 192.168.30.1 255.255.255.0
Ruijie(config-int-vlan)#interface vlan 40          ------->interconnect with ac
Ruijie(config-int-vlan)#ip address 192.168.40.1 255.255.255.0
Ruijie(config-int-vlan)#exit
```

Step3：Conifg ip dhcp server

```
Ruijie(config)#service dhcp
Ruijie(config)#ip dhcp pool ap_ruijie      ------->create dhcp pool for ap,pool
name is ap_ruijie
Ruijie(config-dhcp)#option 138 ip 1.1.1.1      ------->config option 138,
assign ac loopaback 0 ip address
Ruijie(config-dhcp)#network 192.168.10.0 255.255.255.0      ------->assign
these address to ap
Ruijie(config-dhcp)#default-route 192.168.10.1      ------->assign the gateway
to ap
```

```
Ruijie(config-dhcp)#exit
Ruijie(config)#ip dhcp pool user_ruijie1      ------->create dhcp pool for sta,pool name is user_ruijie
Ruijie(config-dhcp)#network 192.168.20.0 255.255.255.0      ------->assign these address to sta
Ruijie(config-dhcp)#default-route 192.168.20.1    ------->assign the gateway to sta
Ruijie(config-dhcp)#dns-server 8.8.8.8    ------->assign the dns to sta
Ruijie(config-dhcp)#exit
Ruijie(config)#ip dhcp pool user_ruijie2      ------->create dhcp pool for sta,pool name is user_ruijie
Ruijie(config-dhcp)#network 192.168.30.0 255.255.255.0      ------->assign these address to sta
Ruijie(config-dhcp)#default-route 192.168.30.1    ------->assign the gateway to sta
Ruijie(config-dhcp)#dns-server 8.8.8.8    ------->assign the dns to sta
Ruijie(config-dhcp)#exit
```

Step4：Config static routing

```
Ruijie(config)#ip route 1.1.1.1 255.255.255.255 192.168.40.2      ------
->config static route, route to AC loopback0
```

Step5：Save configuration

```
Ruijie(config)#exit
Ruijie#write
```

3) Configure access switch (SW2)

Step1：Config vlan, create ap vlan

```
Ruijie>enable
Ruijie#configure terminal
Ruijie(config)#vlan 10
Ruijie(config-vlan)#exit
```

Step2：Config interface

```
Ruijie(config)#interface GigabitEthernet 0/1
Ruijie(config-int-GigabitEthernet 0/1)#switchport access vlan 10 ------
->connect to AC,    access port, allow ap vlan
Ruijie(config-int-GigabitEthernet 0/1)#exit
Ruijie(config)#interface GigabitEthernet 0/2
Ruijie(config-int-GigabitEthernet 0/2)#switchport mode trunk          ------
->connect to SW1, trunk port
```

Step3：Save configuration

```
Ruijie(config-int-GigabitEthernet 0/2)#end
Ruijie#write
```

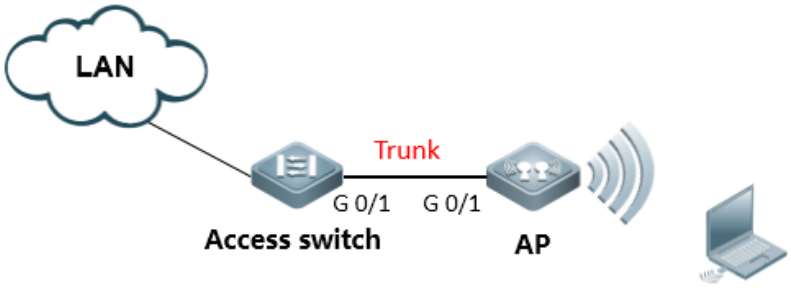
Expected Result:	1) STA will be able to connect to the SSID 2) The AP and AC CAPWAP tunnel is established: Ruijie#show ap-config summary ========= show ap status ========= Radio: E = enabled, D = disabled, N = Not exist Current Sta number Channel: * = Global Power Level = Percent Online AP number: 1 Offline AP number: 0 AP Name IP Address Mac Address Radio 1 Radio 2 Up/Off time State --- --- --- --- --- --- --- 1414.4b13.c248 192.168.10.2 1414.4b13.c248 E 1 6* 100 E 0 153* 100 0:09:04:28 Run
Test Conclusion:	

1.2 Local Forwarding

Test Item	Local Forwarding
Description	The test AP establishes CAPWAP tunnel with the AC using Local Forwarding mode
Test Procedure	**Procedure:** 1) The AP establishes CAPWAP Tunnel with the AC (See above test procedure) 2) Configure the access switch POESwtich(config)#interface gigabitEthernet 0/2 **---> the port connects to AP** POESwtich(config-GigabitEthernet 0/2)#switchport mode trunk POESwtich(config-GigabitEthernet 0/2)#switchport trunk native vlan 10 **-->10 is AP's management Vlan** POESwtich(config-GigabitEthernet 0/2)#switchport trunk allowed vlan remove 1-9,11-19,21-4094 **--->Prune all VLANs except for AP management Vlan and user data Vlan** 3) Configure the AC AC(config)#wlan-config 1 ruijie AC(config-wlan)#tunnel local **----->enable local forwarding in WLAN 1** AC(config)#ap-group ruijie AC(config-ap-group)#no interface-mapping 1 10 **----->all wireless user under this ap-group will be forced offline** AC(config-ap-group)#interface-mapping 1 10 **--->Reassociate WLAN ID and VLAN ID to make configuration effect**

Expected Result:	The PoE Switch learns the MAC address of wireless users on the downlink port that connects to AP (on Central forwarding mode, the access switch won't learn the user's MAC address since the user data is encapsulated in CAPWAP tunnel) POESwtich(config)#show mac-address-table Vlan MAC Address Type Interface 10 0000.5e00.0101 DYNAMIC GigabitEthernet 0/1 10 001a.a97e.9dce DYNAMIC GigabitEthernet 0/1 10 001a.a9bc.179f DYNAMIC GigabitEthernet 0/3 10 0026.c763.3310 DYNAMIC GigabitEthernet 0/1 10 0811.9692.244c DYNAMIC GigabitEthernet 0/2 20 001a.a94e.d52a DYNAMIC GigabitEthernet 0/2 30 0000.5e00.0101 DYNAMIC GigabitEthernet 0/1 30 001a.a97e.9dce DYNAMIC GigabitEthernet 0/1 30 001a.a9bc.179f DYNAMIC GigabitEthernet 0/3
Test Conclusion:	

1.3 Fat Mode

Test Item	Fat Mode
Description	AP switches to FAT mode and broadcast SSIDs
Test Procedure	**Topology:**  SSID vlan IP subnet ruijie1 vlan10 172.16.10.0/24 ruijie2 vlan20 172.16.20.0/24 **Procedure:** Step1: Connect console Default password：ruijie Step2: Set AP mode fat Default mode：fit Ruijie>ap-mode fat Step3：Create VLAN and dhcp server (ignore dhcp configuration when using other dhcp server) Ruijie>enable

```
Ruijie#configure terminal
Ruijie(config)#vlan 1
Note：VLAN 1 is only of local meaning
Ruijie(config-vlan)#vlan 10 ------>create user vlan10
Ruijie(config-vlan)#vlan 20   ------>create user vlan20
Ruijie(config)#service dhcp     ------>enable dhcp service
Ruijie(config)#ip dhcp excluded-address 172.16.10.253 172.16.10.254 -
----->these address will not assign to user
Ruijie(config)#ip dhcp excluded-address 172.16.20.253 172.16.20.254
Ruijie(config)#ip dhcp pool test_10 ------>config dhcp pool named
with test_10
Ruijie(dhcp-config)#network 172.16.10.0 255.255.255.0
Ruijie(dhcp-config)#dns-server 218.85.157.99
Ruijie(dhcp-config)#default-router 172.16.10.254
Ruijie(dhcp-config)#exit
Ruijie(config)#ip dhcp pool test_20   ------>config dhcp pool named
with test_20
Ruijie(dhcp-config)#network 172.16.20.0 255.255.255.0
Ruijie(dhcp-config)#dns-server 218.85.157.99
Ruijie(dhcp-config)#default-router 172.16.20.254
```

Step4: Configure dot1q

```
Ruijie(config)#interface GigabitEthernet 0/1
Ruijie(config-if)#encapsulation dot1Q 1
Ruijie(config)#interface GigabitEthernet 0/1.10
Ruijie(config-if)#encapsulation dot1Q 10
Ruijie(config)#interface GigabitEthernet 0/1.20
Ruijie(config-if)#encapsulation dot1Q 20
```

Step5: Configure SSID

```
Ruijie(config)#dot11 wlan 10
Ruijie(dot11-wlan-config)#broadcast-ssid
Ruijie(dot11-wlan-config)#ssid ruijie1
Ruijie(config)#dot11 wlan 20
Ruijie(dot11-wlan-config)#broadcast-ssid
Ruijie(dot11-wlan-config)#ssid ruijie2
```

Step6: Configure Radio interface

```
Ruijie(config)#interface Dot11radio 1/0.1
Ruijie(config-if-Dot11radio 1/0.1)#encapsulation dot1Q 1
Ruijie(config)#interface Dot11radio 1/0.10
Ruijie(config-if-Dot11radio 1/0.10)#encapsulation dot1Q 10   -----
->encapsulation vlan 10
Ruijie(config)#interface Dot11radio 1/0.20
```

```
Ruijie(config-if-Dot11radio 1/0.20)#encapsulation dot1Q 20    -----
->encapsulation vlan 20
Ruijie(config)#interface Dot11radio 2/0.10
Ruijie(config-if-Dot11radio 2/0.10)#encapsulation dot1Q 10     -----
->encapsulation vlan 10
Ruijie(config)#iinterface Dot11radio 2/0.20
Ruijie(config-if-Dot11radio 2/0.20)#encapsulation dot1Q 20    -----
->encapsulation vlan 20
```

Step7：Associate SSID

```
Ruijie(config)#interface Dot11radio 1/0
Ruijie(config-if-Dot11radio 1/0)#wlan-id 10
Config interface wlan id:10, SSID:ruijie1          // success log
Ruijie(config)#interface Dot11radio 1/0.1
Ruijie(config-if-Dot11radio 1/0.1)#wlan-id 20
Config interface wlan id:20, SSID:ruijie2          // success log
Ruijie(config)#interface Dot11radio 2/0
Ruijie(config-if-Dot11radio 2/0)#wlan-id 10
Config interface wlan id:10, SSID:ruijie1          // success log
Ruijie(config)#interface Dot11radio 2/0.1
Ruijie(config-if-Dot11radio 2/0.1)#wlan-id 20
Config interface wlan id:20, SSID:ruijie2          // success log
```

Step8：Configure MGMT IP and routing

```
Ruijie(config)#interface BVI 1 ------>configure MGMT IP address,vlan
1 map bvi 1
Ruijie(config-if)#ip address 172.16.1.253 255.255.255.0
Ruijie(config)#interface bvi 10
Ruijie(config-if-BVI 10)#ip address 172.16.10.253 255.255.255.0
Ruijie(config)#interface bvi 20
Ruijie(config-if-BVI 20)#ip address 172.16.20.253 255.255.255.0
Ruijie(config)#ip route 0.0.0.0 0.0.0.0 172.16.1.254
Ruijie(config)#end
Ruijie#write
```

Step9：Config switch

```
Access_switch：
Access_switch(config)#vlan   1
Access_switch(config-vlan)#exit
Access_switch(config)#interface vlan 1
Access _switch(config-VLAN 1)#ip address 172.16.1.254 255.255.255.0
Access_switch(config)#interface vlan 10
Access_switch(config-VLAN 10)#ip address 172.16.10.254
255.255.255.0
```

	Access_switch(config)#interface vlan 20
	Access_switch(config-VLAN 20)#ip address 172.16.20.254 255.255.255.0
	Access_switch(config-VLAN 20)#exit
	Access_switch(config)#interface gigabitEthernet 0/1 // downlink to AP
	Access_switch(config-GigabitEthernet 0/1)#switchport mode trunk
	Access_switch(config)#interface gigabitEthernet 0/2 //access switch uplink
	Access_switch(config-GigabitEthernet 0/2)#switchport mode trunk

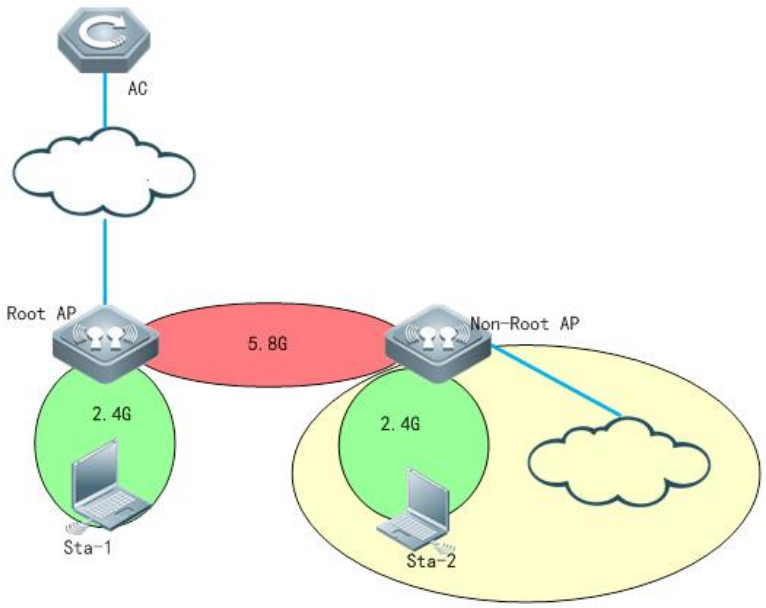
Expected Result:	STAs are able to connect the SSID and ping to their gateway
Test Conclusion:	

2. Common Function

2.1 Rate Limit

Test Item	Rate Limit
Description	Limit the average data rate and burst data rate to each wireless user connected to the AP
Test Procedure	**Procedure:** 1) The AP establishes CAPWAP Tunnel with the AC (See above test procedures) 2) Configure AC: Ruijie(config)#ap-config AP Ruijie(config-ap)#ap-based per-user-l imit down-streams average-data-rate 800 burst-data-rate 1600 Attention: The unit is 8K Bit = 1K Byte.
Expected Result:	1. Connect to wlan and have a speed test 2. The average speed rate will be limited to 800KBps
Test Conclusion:	

2.2 Wireless Bridge

Test Item	Wireless Bridge
Description	A wireless tunnel will be established between 2 APs
Test Procedure	**Topology:**  **Note: only outdoor Aps support wireless bridge** **Procedure:** 1) Make sure that Root AP has established capwap tunnel with AC, verify by following command in controller： Ruijie#sh capwap state CAPWAP tunnel state, 1 peers, 1 is run: Index Peer IP PortState 1 110.10.10.10 5246 Run 2) Configure Root-AP by using following command on controller： AC(config)#wlan-config 100 wds-test-root **------>configure a special ssid for wds** AC(config-wlan)#exit AC(config)#wlan-config 200 wds-test-2.4G**------>Configure assid for 2.4g signal cover** AC(config-wlan)#exit AC(config)#vlan 100 **------>Configure vlan for wds AP** AC(config-vlan)#exit

```
AC(config)#vlan 200 ------>Configure vlan for clients
AC(config-vlan)#exit
AC(config)#int vlan 100 ------>Configure dhcp pool for wds AP
AC(config-if-VLAN 100)#ip address 90.0.100.254 255.255.255.0
AC(config-if-VLAN 100)#exit
AC(config)#int vlan 200 ----->Configure dhcp pool for clients
AC(config-if-VLAN 200)#ip address 90.0.200.254 255.255.255.0
AC(config-if-VLAN 200)#exit
AC(config)#ip dhcp pool vlan-100
AC(dhcp-config)#network 90.0.100.0 255.255.255.0
AC(dhcp-config)#default-router 90.0.100.254
AC(dhcp-config)#option 138 ip 10.10.10.10
AC(dhcp-config)#exit
AC(config)#ip dhcp pool vlan-200
AC(dhcp-config)#network 90.0.200.0 255.255.255.0
AC(dhcp-config)#default-router 90.0.200.254
AC(dhcp-config)#dns-server 192.168.58.110
AC(dhcp-config)#exit
AC(config)#service dhcp    ----->enable dhcp service
AC(config)#ap-group wds        ---------> configure a new ap-group to
associate the wlan-id and vlan
AC(config-group)#interface-mapping 100 100 radio 2
AC(config-group)#interface-mapping 200 200 radio 1
AC(config-group)#exit
AC(config)#ap-config ap630    -------> configure the AP which needs to be
set as Root-AP in WDS
AC(config-ap)#ap-group wds
AC(config-ap)#station-role root-bridge bridge-wlan 1 radio 2
AC(config-ap)#end
AC#write
```

3) Configure the non-root Ap

Change AP to fat-mode

```
Ruijie#conf
Ruijie#(config)ap-mode fat
```

Connect AP (with ip add 192.168.110.1), and run the following command in this AP:

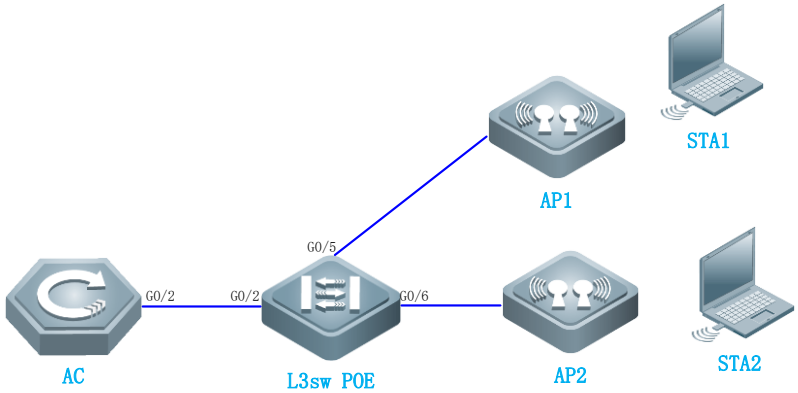
<table>
<tr>
<td></td>
<td>
<pre>Ruijie#conf
Ruijie(config)#int dot11radio 2/0
Ruijie(config-if-Dot11radio 2/0)#station-role non-root-bridge
Ruijie(config-if-Dot11radio 2/0)#parent ssid wds-test-root ------> bridge SSID
Ruijie(config-if-Dot11radio 2/0)#wds pre-config create
Ruijie(config-if-Dot11radio 2/0)#exit</pre>
Change the AP to fit mode
<pre>Ruijie#conf
Ruijie#(config)ap-mode fit ----->change AP to fit mode, then ap will reload automatically, the WDS will be set up successfully.</pre>
</td>
</tr>
<tr>
<td>Expected Result:</td>
<td>
1) the bridge status will be shown on the controller
<pre>AC#show ap-config wds-bridge summary</pre>
<pre>WS5708#sh ap-config wds-bridge-info summary
Ap NameMac Address Radio Station-Role
--------------- --------------- ----- ---------------
1414.4bc2.3156 1414.4bc2.3156 2NONROOT-BRIDGE
630wdsxia 28fb.d311.48d9 2ROOT-BRIDGE</pre>
<pre>WS5708#sh ap-config wds-bridge-info 630wdsxia radio 2
WDS-MODE: ROOT-BRIDGE
BRIDGE-WLAN:
Status: OK
WlanID 1, SSID wds-test-root, BSSID 06fb.d311.48dd

WBI 2/0
NONROOT 0014.4bc2.315a
WS5708#sh ap-config wds-bridge-info 1414.4bc2.3156 radio 2
WDS-MODE: NONROOT-BRIDGE
MAC: 0014.4bc2.315a

WBI 2/0
ROOT 06fb.d311.48dd</pre>
2) The ping from non-root AP to root AP will be successful
</td>
</tr>
</table>

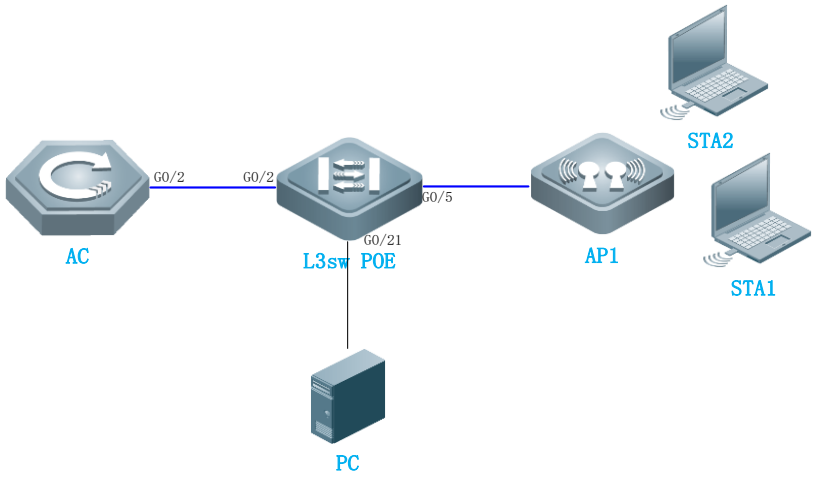
	Ruijie#ping 10.10.10.10 Sending 5, 100-byte ICMP Echoes to 10.10.10.10, timeout is 2 seconds: < press Ctrl+C to break > !!!!! Success rate is 100 percent (5/5), round-trip min/avg/max = 1/4/11 ms. Ruijie#
Test Conclusion:	

2.3 AP load balance

Test Item	AP load balance
Description	Load balancing based on the number of users
Test Procedure	**Topology:**  **Note: AP need to broadcast the same SSID signal.** **Procedure:** 1) Create a number-based balancing group on the AC, named test1. Ruijie(config)#ac-controller Ruijie(config-ac)#num-balance-group create test1 2) Configure the load balance threshold Ruijie(config-ac)#num-balance-group num test1 1 **-----> when the difference of more than 1 STAs on APs, the AP which carries more users will not response new associations.** 3) Add APs to the load balance group Ruijie(config-ac)#num-balance-group add test1 ap320-1 **---->put AP named ap320-i into load balance group** Ruijie(config-ac)#num-balance-group add test1 ap320-2

Expected Result:	1) The load balance state will be shown on AC Ruijie#show ac-config flow-balance summary Group State Enable Threshold Base mode AP NAME flow_huiyi UP 5*100kbps 4% 10 ap-mode(0) ap220-1,ap220-2 2) Perform the following step: 1. Before configuring the load balancing, associate STA1 and STA2 with the network. Run ***show ac-config client*** to confirm that STA1 and STA2 are associated with AP1. 2. Get STA1 and STA2 offline. Configure the load balancing group based on the number of users. 3. Associate STA1 with the network. Run ***show ac-config client*** to confirm that STA1 is associated with AP1. 4. Associate STA2 with the network. The STA2 is associated with the network in a short period of time. Run ***show ac-config client*** to confirm that STA2 is associated with AP2
Test Conclusion:	

2.4 Remote Intelligent Perceptive Technology (RIPT)

Test Item	Remote Intelligent Perceptive Technology (RIPT)
Description	When the CAPWAP tunnel between AP and AC is down, the AP is still able to transfer user data normally.
Test Procedure	**Topology:**  **Procedure:** 1) The AP establishes CAPWAP Tunnel with the AC (See above test procedure)

	2) configure RIPT as below steps: 1. Configure escape SSID Ruijie(config)#wlan-config 10 "escape SSID" Ruijie(config-wlan)#tunnel local Ruijie(config-wlan)# enable-ssid at-capwap-down 2. Enable RIPT under AP group configuration mode Ruijie(config)#ap-group default Ruijie(config-group)#ript enable
Expected Result:	1. Ping the PC from STA 2. Shutdown the physical interface of AC 3. STA is still be able to ping the PC
Test Conclusion:	

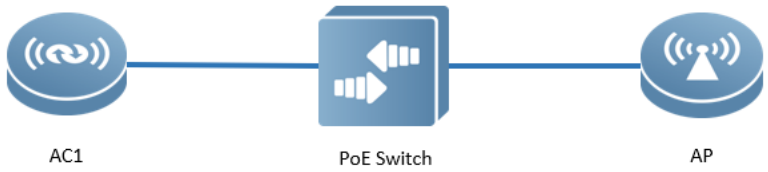
2.5 AC Virtualization (VAC)

Test Item	AC Virtualization (VAC)
Description	Multiple ACs will be virtualized into one logical AC
Test Procedure	**Topology:**  **Procedure:** Configure the AC1: AC(config)#virtual-ac domain 90 # The domain ID is a digit. The same domain ID must be configured for each AC. AC(config-vac-domain)#device 1 # Specify the device ID of the AC. AC(config-vac-domain)#device 1 priority 100 # A higher priority indicates a higher probability of being selected as the active AC. AC(config-vac-domain)#exit AC(config)# vac-port

<table>
<tr><td></td><td>AC(config-vac-port)#port-member interface gigabitEthernet 0/5 # Specify VSL ports. On the WS card, specify TE ports as VSL ports.
Configure the AC2
AC(config)#virtual-ac domain 90
AC(config-vac-domain)#device 2 # Specify the device ID of the AC.
AC(config-vac-domain)#device 2 priority 90
AC(config-vac-domain)#exit
AC(config)# vac-port
AC(config-vac-port)#port-member interface gigabitEthernet 0/5
Switch the 2 ACs to the VAC mode
AC#write
AC#device convert mode virtual
Convert mode will backup and delete config file, and reload the switch. Are you sure to continue[yes/no]:yes
Do you want to recover config file from backup file in virtual mode (press 'ctrl + c' to cancel) [yes/no]:yes</td></tr>
<tr><td>Expected Result:</td><td>Run show virtual-ac command, each AC’s information will be displayed.
<table><tr><th>Device_id</th><th>Domain_id</th><th>Priority</th><th>Position</th><th>Status</th><th>Role</th><th>Description</th></tr><tr><td>1(1)</td><td>90(90)</td><td>100(100)</td><td>LOCAL</td><td>OK</td><td>ACTIVE</td><td>switch1-slot3</td></tr><tr><td>2(2)</td><td>90(90)</td><td>90(90)</td><td>REMOTE</td><td>OK</td><td>STANDBY</td><td>switch1-slot4</td></tr></table></td></tr>
<tr><td>Test Conclusion:</td><td></td></tr>
</table>

3. Security Function

3.1 Wireless Encryption (WPA/WPA2)

<table>
<tr><td>Test Item</td><td>Wireless Encryption (WPA/WPA2)</td></tr>
<tr><td>Description</td><td>Wireless user needs to input password when connect to wireless network.</td></tr>
<tr><td>Test Procedure</td><td>Topology:
 

Procedure:
1. WPA configuration
WS5708(config)#wlansec 1</td></tr>
</table>

<table>
<tr><td></td><td>

```
WS5708(config-wlansec)#security wpa enable
WS5708(config-wlansec)#security wpa ciphers aes enable
WS5708(config-wlansec)#security wpa akm psk enable
WS5708(config-wlansec)#security wpa akm psk set-key ascii
1234567890      ---->wifi password, no less than 8 digits
```

2. WPA2 configuration

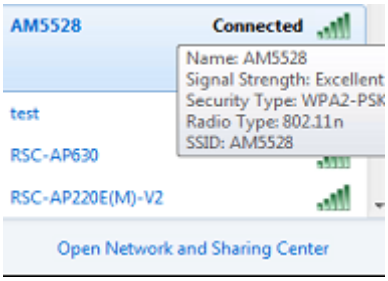
```
WS5708(config)#wlansec 1
WS5708(config-wlansec)#security rsn
WS5708(config-wlansec)#security rsn ciphers aes
WS5708(config-wlansec)#security rsn akm psk
WS5708(config-wlansec)#security rsn akm psk set-key ascii
1234567890      ---->wifi password, no less than 8 digits
```

Note: One SSID can support both WPA and WPA2, but two passwords MUST match.

</td></tr>
<tr><td>Expected Result:</td><td>

1. when connecting the SSID, the security key authentication is required

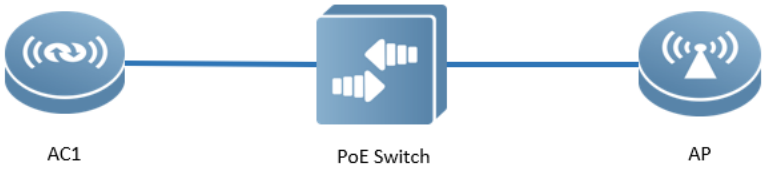
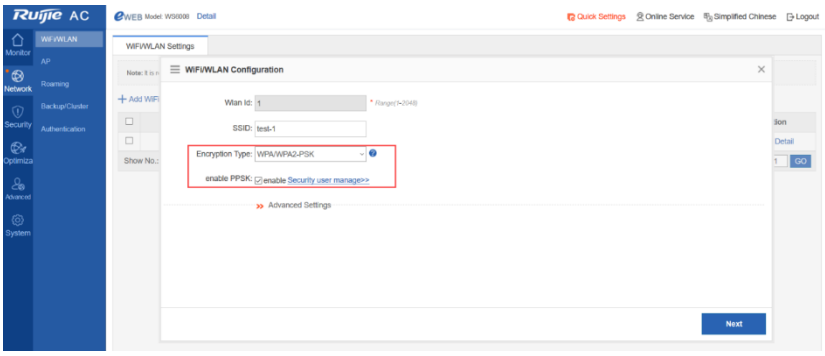
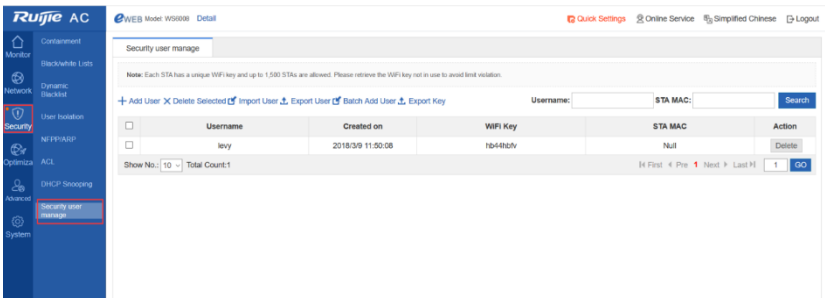
2. type in the right security key, the STA can connect wireless network successfully

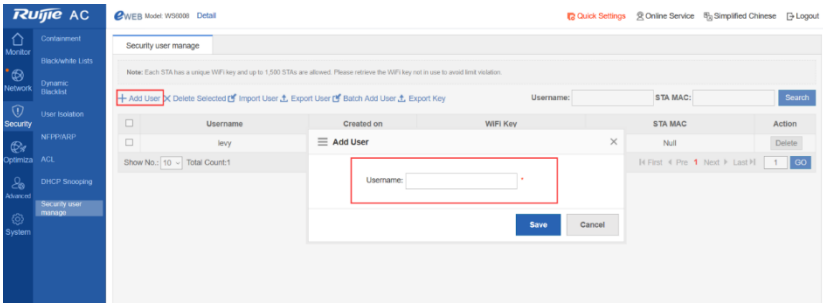
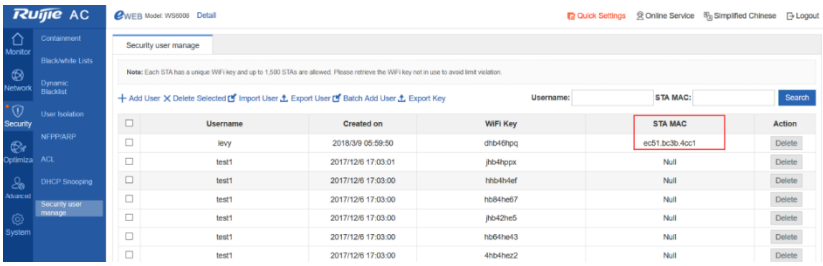


</td></tr>
<tr><td>Test Conclusion:</td><td></td></tr>
</table>

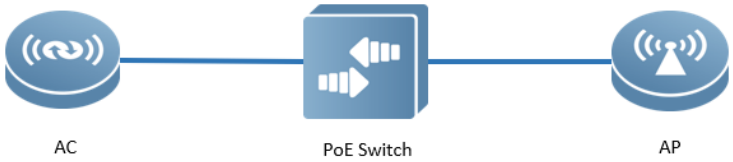
3.2 Private Pre-Shared Key (PPSK)

Test Item	Private Pre-Shared Key (PPSK)

Description	Different STAs uses different passwords to connect the same SSID
Test Procedure	**Topology:**  **Procedure:** 1) Enabling the PPSK On the AC's Web page, choose **Network** > **WiFi/WLAN**, select **WPA/WPA2-PSK**, and select **Enable PPSK**.  2) PPSK Account Management On the Web page, choose **Security** > **Security user manage**. The following figure shows the effect of importing user names.  3) Add users Click **Add User**. The following dialog box is displayed. Enter the user name. A random 8-character key is automatically generated. Add at least 2 users for testing.

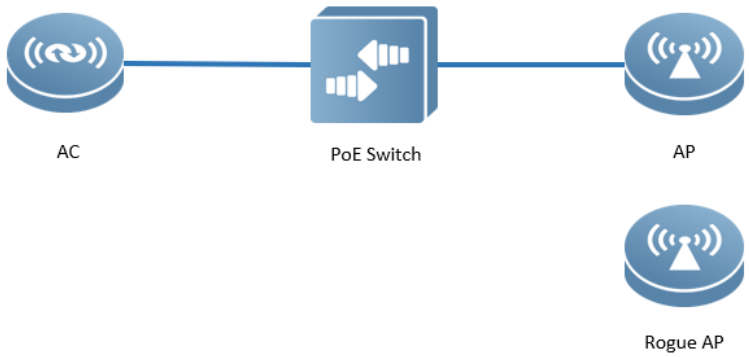
	
Expected Result:	Connect 2 STAs to the SSID with different passwords. After STAs authentication succeed, the STAs MAC address will be displayed on the **Security user manage** page. 
Test Conclusion:	

3.3 Blacklist & Whitelist

Test Item	Blacklist & Whitelist
Description	When blacklist is enabled, STAs within the blacklist cannot access the wireless network. When whitelist is enabled, only STAs within the whitelist ca access the wireless network.
Test Procedure	**Topology:**  **Procedure:** Blacklist: WS5302(config)#wids WS5302(config-wids)#static-blacklist mac-address 6809.27b0.169f ----->6809.27b0.169f is denied to access Whitelist:

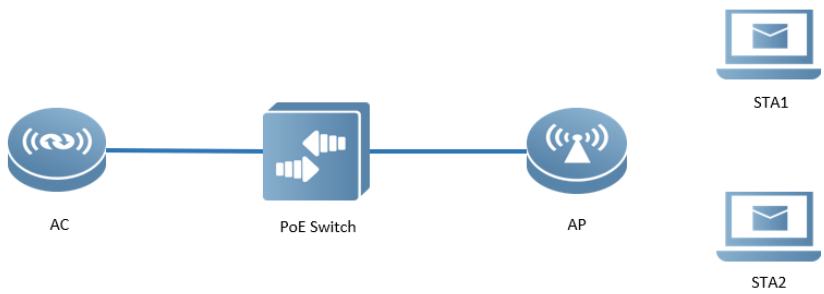
	WS5302(config)#wids WS5302(config-wids)#whitelist mac-address 6809.27b0.169f **-----> only 6809.27b0.169f is allowed to access**
Expected Result:	1. if blacklist is enabled, the STA with MAC address 6809.27b0.169f cannot connect to the network. 2. if whitelist is enabled, all STAs except 6809.27b0.169f cannot connect to the network.
Test Conclusion:	

3.4 AP Countermeasure

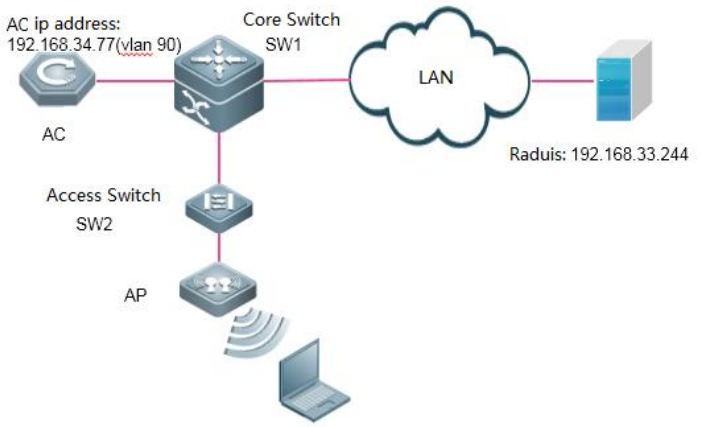
Test Item	AP Countermeasure
Description	Ruijie AP interferes with STAs connecting to APs from other vendors
Test Procedure	**Topology:**  **Note: Ruijie AP will not countermeasure Ruijie AP by default. Recommend to use AP from the other vendor as the Rogue AP** **Procedure:** 1) Configure AP as monitor mode AC(config)# ap-config ap220-e AC(ap-config)# device mode monitor 2) Configure countermeasure rogue ap static list AC(config)#wlan-config 5 monitor AC(config-wlan)#no enable-broad-ssid AC(config-wlan)#exit AC(config)#ap-group Countermeasure AC(config-group)#interface-mapping 5 1 AC(config-group)#exit AC(config)# ap-config ap220-e AC(config-ap)#ap-group Countermeasure

	AC(config-ap)#scan-channels 802.11b channels 1 2 3 4 5 6 7 8 9 10 11 12 13 **--->configure the scanning channel of 2.4G** AC(config-ap)#scan-channels 802.11a channels 149 153 157 161 165 **-->configure the scanning channel of 5G** AC(config)#wids **----->enter wids mode** AC(config-wids)#countermeasure enable **----->enable countermeasure** AC(config-wids)#countermeasures channel-match **----->enable channel-based containment** AC(config-wids)#countermeasures mode config **----->choose the countermeasures mode** AC(config-wids)#device attack mac-address 061b.b120.700c **-----> add rogue AP bssid:061b.b120.700c. you can scan rogue AP with Wirelessmon to get the bssid.** Ruijie(config-wids)#countermeasures interval 20
Expected Result:	When STAs connect to the SSID that rogue AP broadcasts, there will be significant packets drop and disconnection.
Test Conclusion:	

3.5 User Isolation

Test Item	User Isolation
Description	Wireless users connect to same AP cannot get access to each other
Test Procedure	**Topology:**  **Procedure:** Isolate user associated to the same AP AC(config)#wids AC(config-wids)#user-isolation ap enable
Expected Result:	Connect 2 STAs to the AP, they cannot ping from each other
Test Conclusion:	

3.6 802.1x Authentication

Test Item	802.1x Authentication
Description	802.1x authentication is required to connect the wireless network
Test Procedure	**Topology:**  **Procedure:** 1. Enable 802.1x AAA authentication AC-1(config)#aaa new-model **---->enable AAA authentication** AC-1(config)#aaa authentication dot1x default group radius **---->define the default group of dot1x authentication** AC-1(config)#aaa accounting network default start-stop group radius **--->define the default group of aaa accounting** 2. Configure Radius server's IP addrsess and KEY AC-1(config)#radius-server host 192.168.33.244 key ruijie **----> configure ip address and key of radiius server** AC-1(config)#ip radius source-interface bvi 90 **----> AC communicate with radius using the IP address of vlan 90** 3. Configure parameters of 802.1x authentication AC-1(config)#dot1x authentication default **----> use default list for dot1x authentication** AC-1(config)#dot1x accounting default **----> use default list for dot1x accounting** AC-1(config)#dot1x eapol-tag **----> make AC able to process authentication packets with VLAN tag** 4. Enable 802.1X authentication AC-1(config)#wlansec 1 **----> enable authentication on wlan 1** AC-1(config-wlansec)# security rsn enable

```
AC-1(config-wlansec)# security rsn ciphers aes enable
AC-1(config-wlansec)# security rsn akm 802.1x enable
```

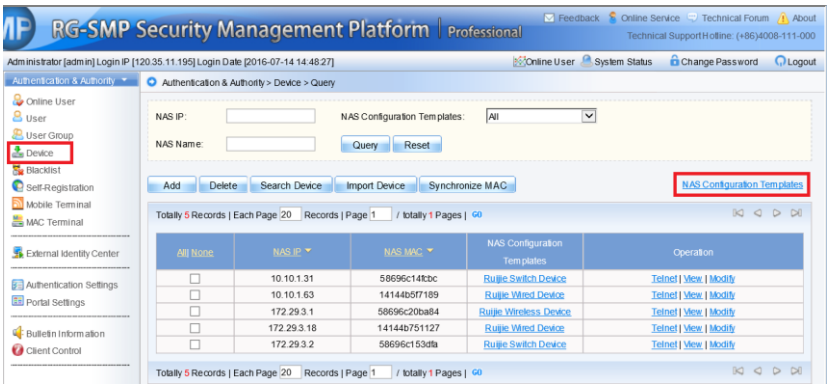
5. Configure SNMP

```
AC-1(config)#snmp-server host 192.168.33.244 traps version 2c ruijie
AC-1(config)#snmp-server enable traps
AC-1(config)#snmp-server community ruijie rw
```

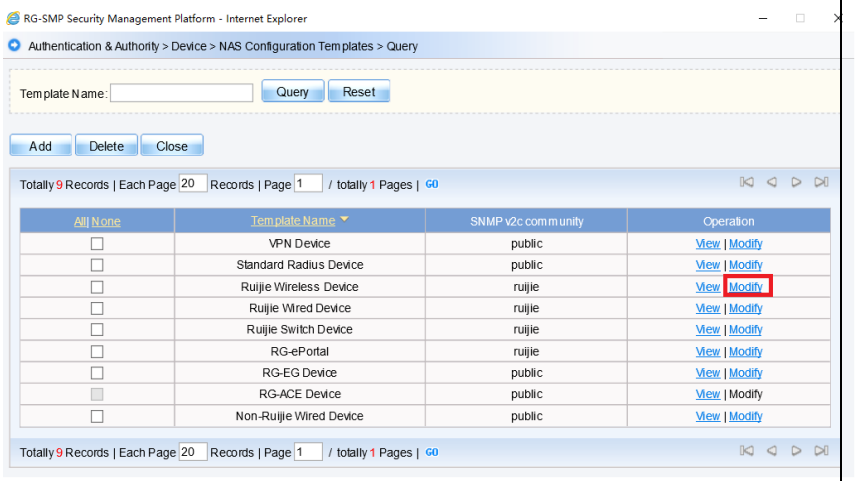
6. Configure radius server

//the configuration may vary with different radius, here we take Ruijie SMP server as an example:

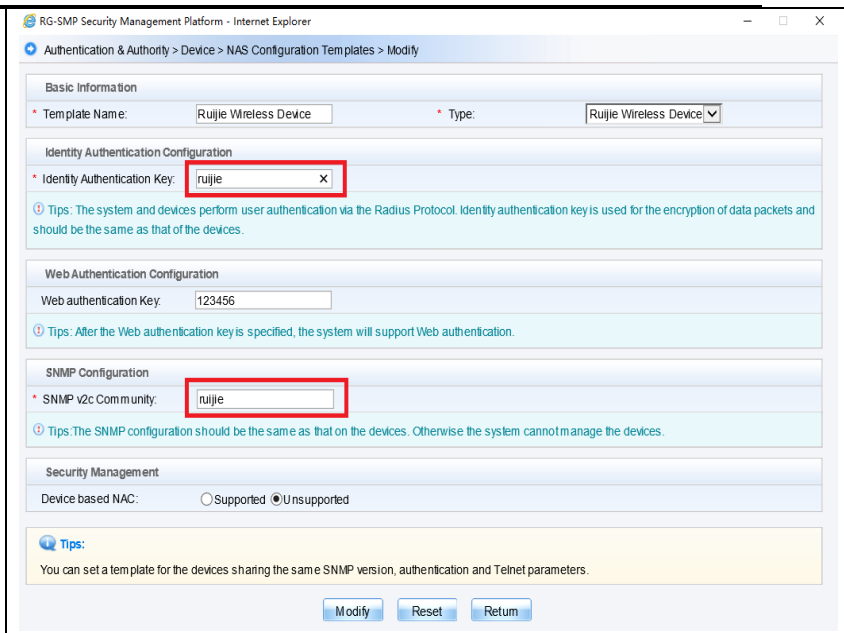
1) Login to SMP server ---> "Authentication & Authority" ---> "Device" ---> "NAS Configuration Templates"



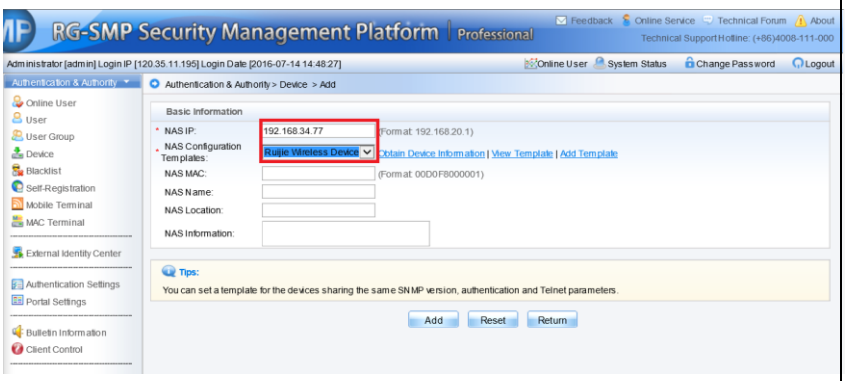
2) Choose "Ruijie Wireless Device", and click "Modify"



3) Configure "Identify Authentication Key" and "SNMP v2c Community"

<table>
<tr>
<td></td>
<td>


4) Add new device, fill in the IP address of the AC, and select "Ruijie Wireless Device" as configuration Templates

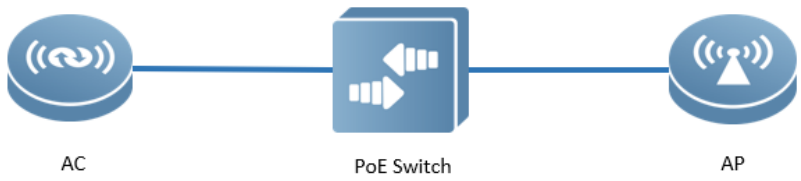


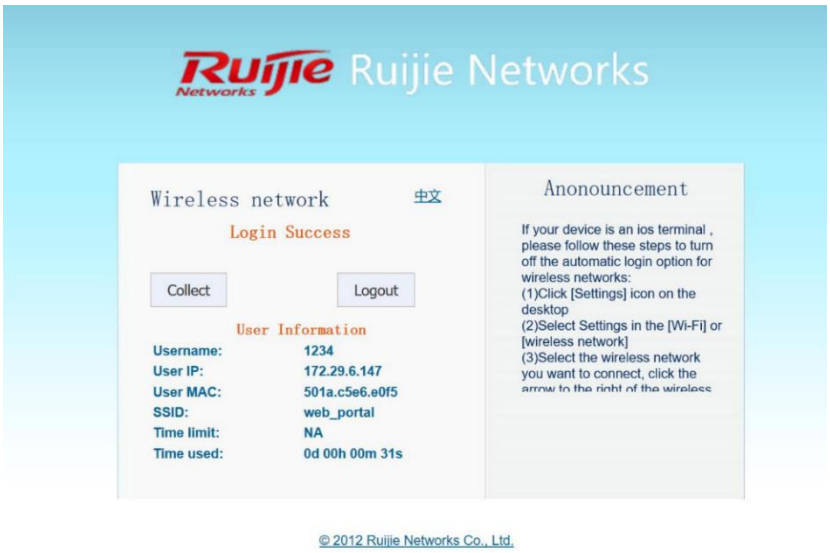
5) Add a new user

</td>
</tr>
<tr>
<td>Expected Result:</td>
<td>1. The STA is able to connect to the SSID with configured username and password
2. "show dot1x summary" command shows online users</td>
</tr>
</table>

	AC#show dot1x summary ID MAC Address Username Interface VLAN Authen-State Backend-State User-Type Online-Duration --- --- --- --- --- --- --- --- --- 3 9c4e.36cc.f6dc lzm Ca1 10 Authenticated Idle static 0days 0h 0m27s
Test Conclusion:	

3.7 Web Authentication

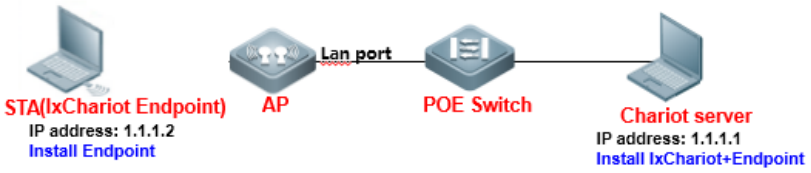
Test Item	Web Authentication
Description	Web authentication is required to connect the wireless network
Test Procedure	**Topology:**  **Procedure:** 1. Configuring AAA AC(config)#aaa new-model **---->enable AAA authentication** AC(config)#aaa accounting network default start-stop none **--->disable aaa accounting** AC(config)#aaa authentication iportal default local **---> authenticaticate with local accounts** 2. Configuring local accounts AC(config)#username admin web-auth password admin **----->configure local username and password** 3. Bypass arp packets of wireless user gateway AC(config)#http redirect direct-arp 192.168.51.1 **------>192.168.51.1 is wireless users' gateway** 4. Enable https AC(config)#http redirect port 443 5. Configuring Wlansec AC(config)#web-auth template iportal AC(config)#wlansec AC(config-wlansec)#web-auth portal iportal AC(config-wlansec)#webauth
Expected Result:	1. Connect to wireless ssid, the authentication page will pops up.

	 2. input the correct username/password, the authentication succeeds. 
Test Conclusion:	

4. Performance

4.1 AP Throughput Performance

Test Item	AP Throughput Performance
Description	Test the AP’s max throughput performance
Test Procedure	**Topology:**

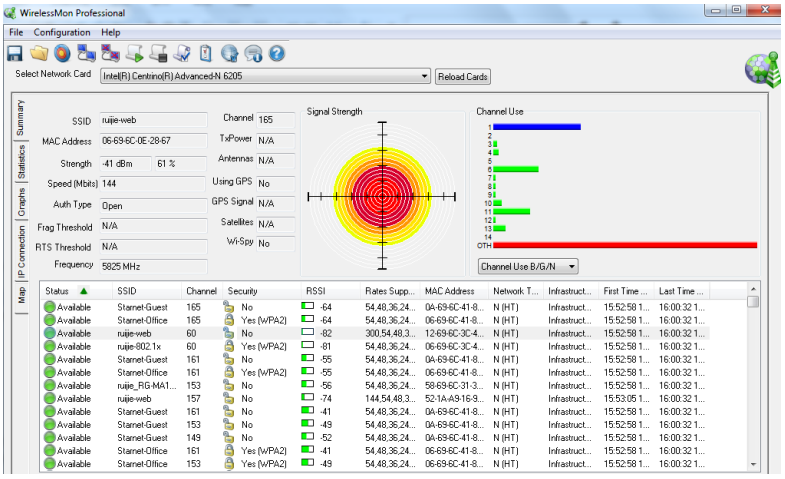


Procedure:

1. Test Environment Check

Use a signal scanning tool such as WirelessMon to scan the onsite environment. If the interference from other service set identifiers (SSIDs) is detected, these SSIDs should be turned off; if they cannot be turned off, the test should avoid the channel where a SSID of strong signal interference is located.

Before the test, you can also use WirelessMon to scan the RSSI of the test SSID to ensure that the RSSI is not smaller than –55 dBm.



When there is any interference in the test environment, configure the AP channel to the one with the smallest interference.

```
AC#conf
AC(config)#ap-config AP530----- The AP name is AP530.
AC(config-ap)#channel 11 radio 1 ---- Change RF interface 1 to Channel 11.
AC(config-ap)#end
```

2. Install IxChariot

IxChariot is the industry's leading test tool for simulating real-world applications and assessing network performance in live networks. IxChariot uses distributed, low-profile endpoint to assess point to point performance and network capacity. It can be used to test the highest performance of an AP, thereby obtaining the its upstream and downstream throughput (official website of IxChariot: http://www.ixiacom.com).

Components of IxChariot:

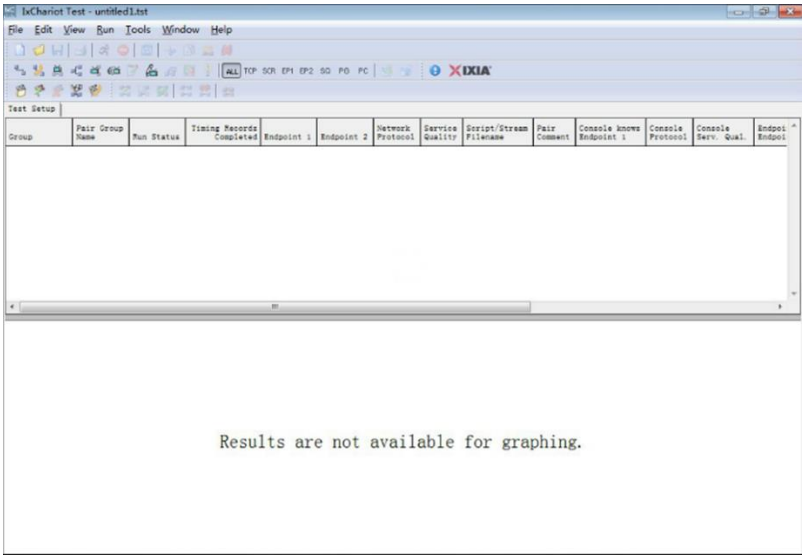
① IxChariot Console: It is installed in the Windows system to generate and simulate traffic, and output the data simulation result.

② Endpoint: It is installed in the Windows system to send and receive traffic.

Step1: Install IxChariot 6.7 (both the Console and Endpoint) on the server.

Step2: Install Endpoint on STAs

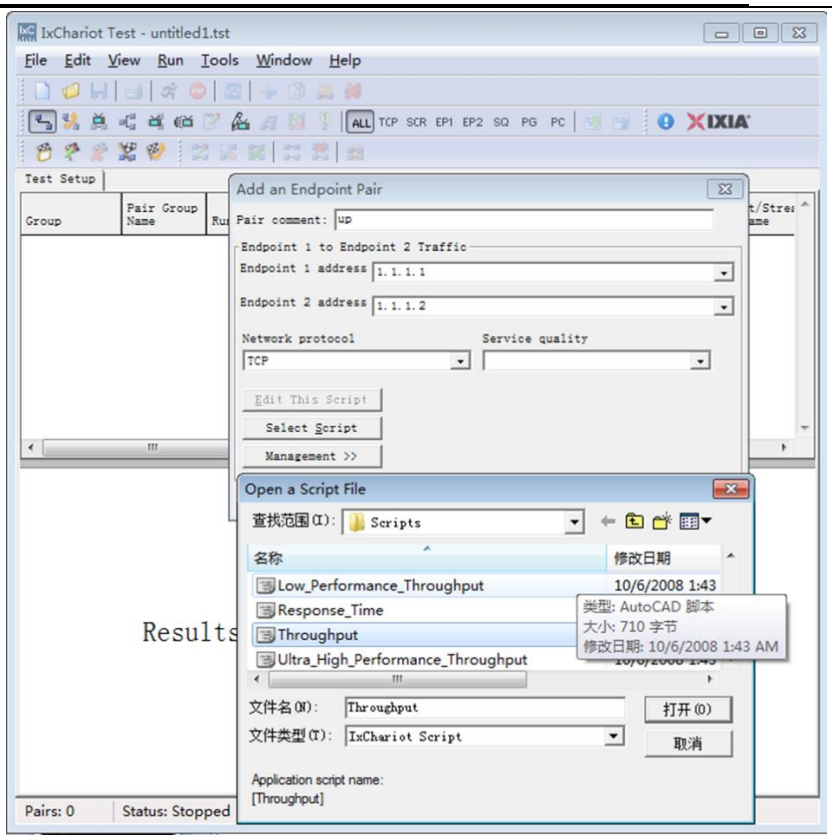
Step3: Start IxChariot



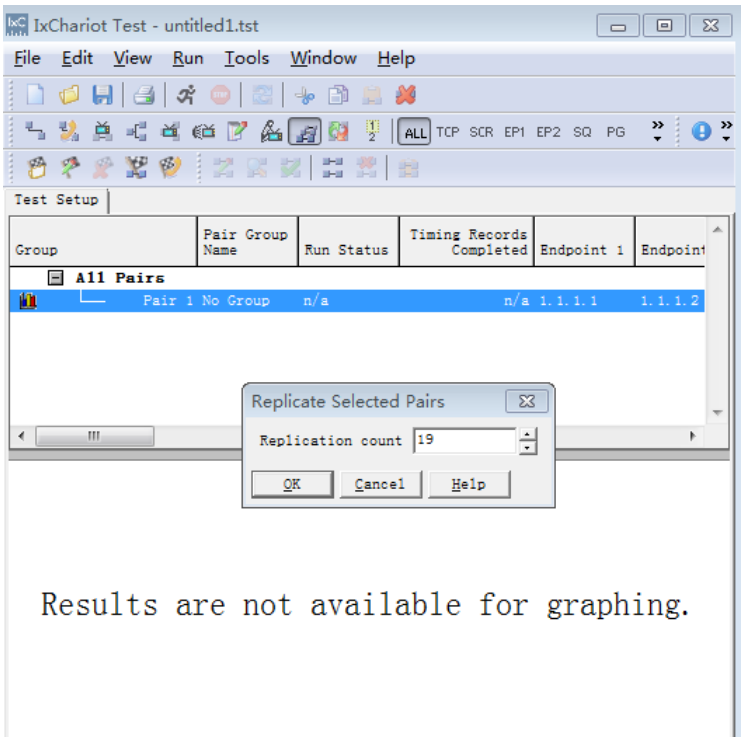
Note: On the server, you should ensure proper running of both the Console and Endpoint, but on an STA, you need to ensure only proper running of the Endpoint.

3. Create a downward data sending stream, and send data from Serve 1.1.1.1 to STA 1.1.1.2.

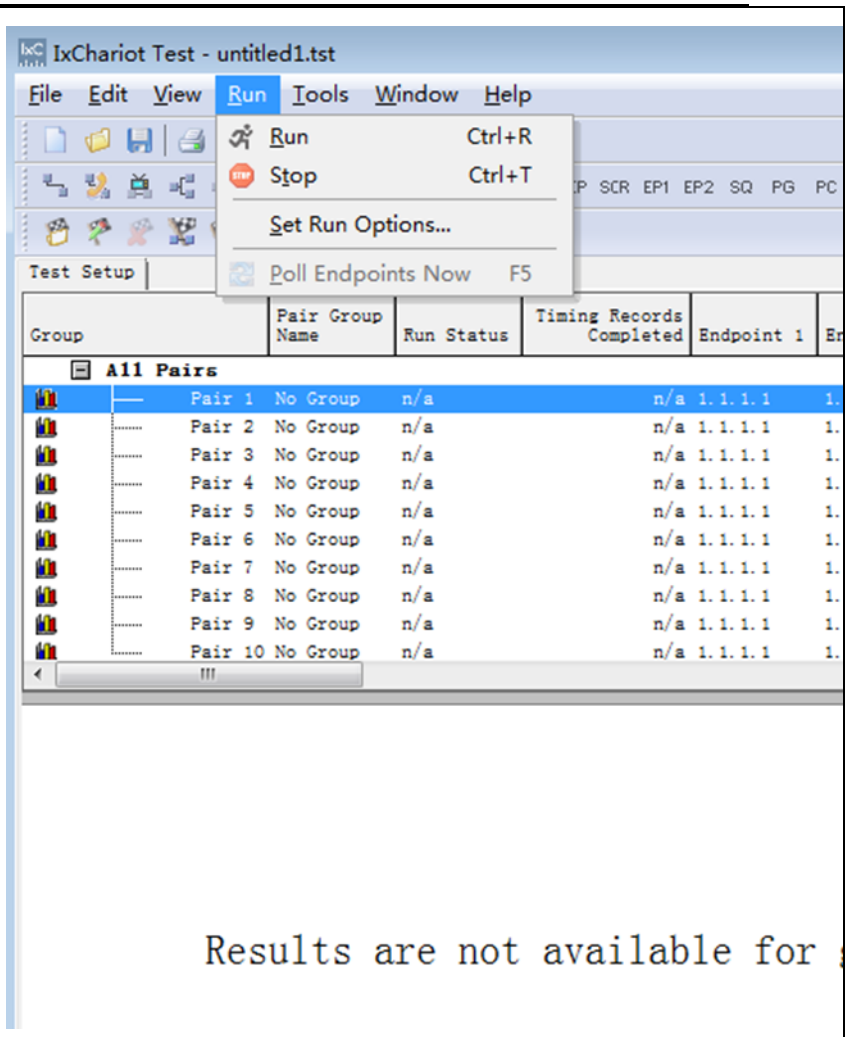
Click  to add a pair.

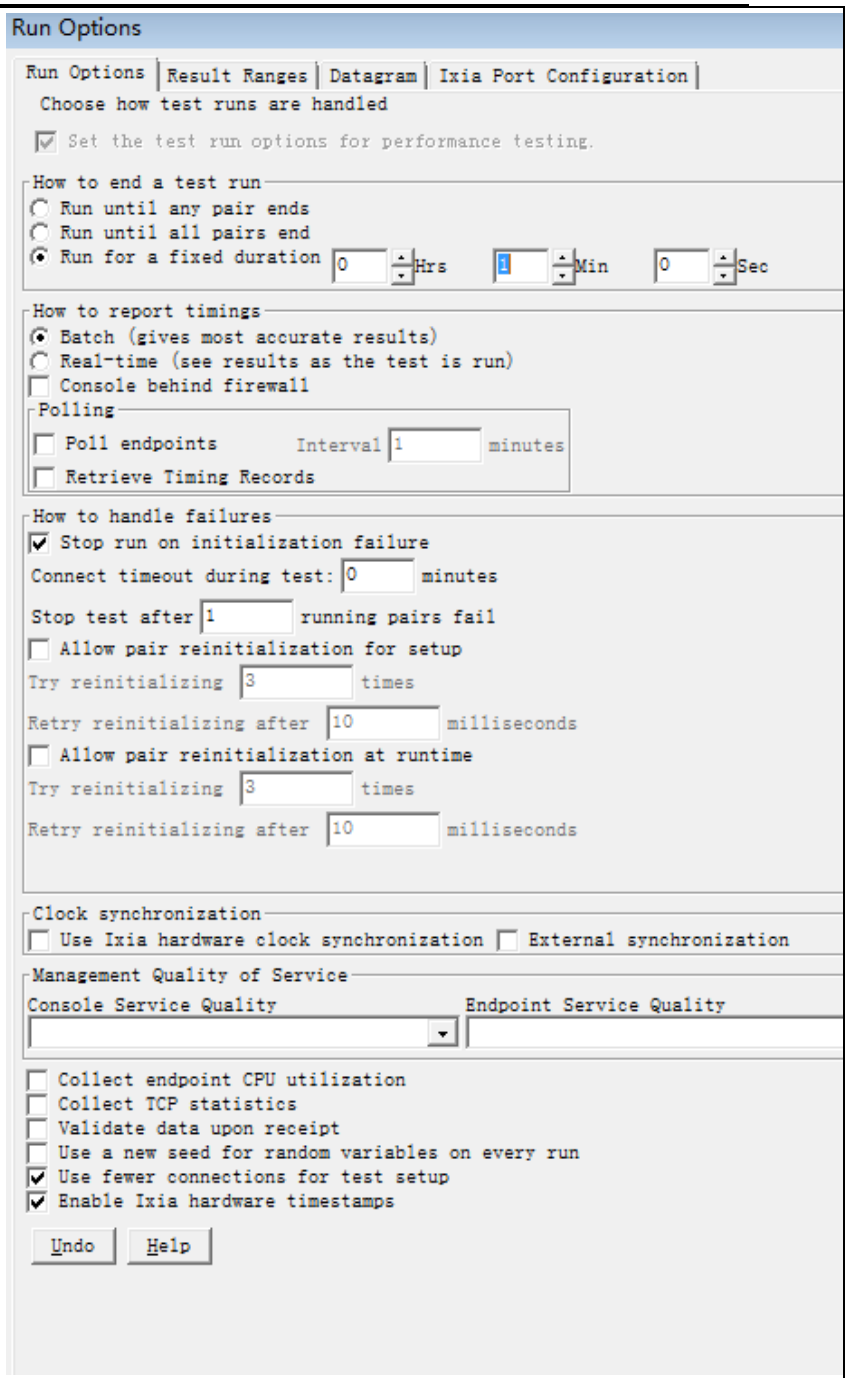


4. Create 20 data streams.

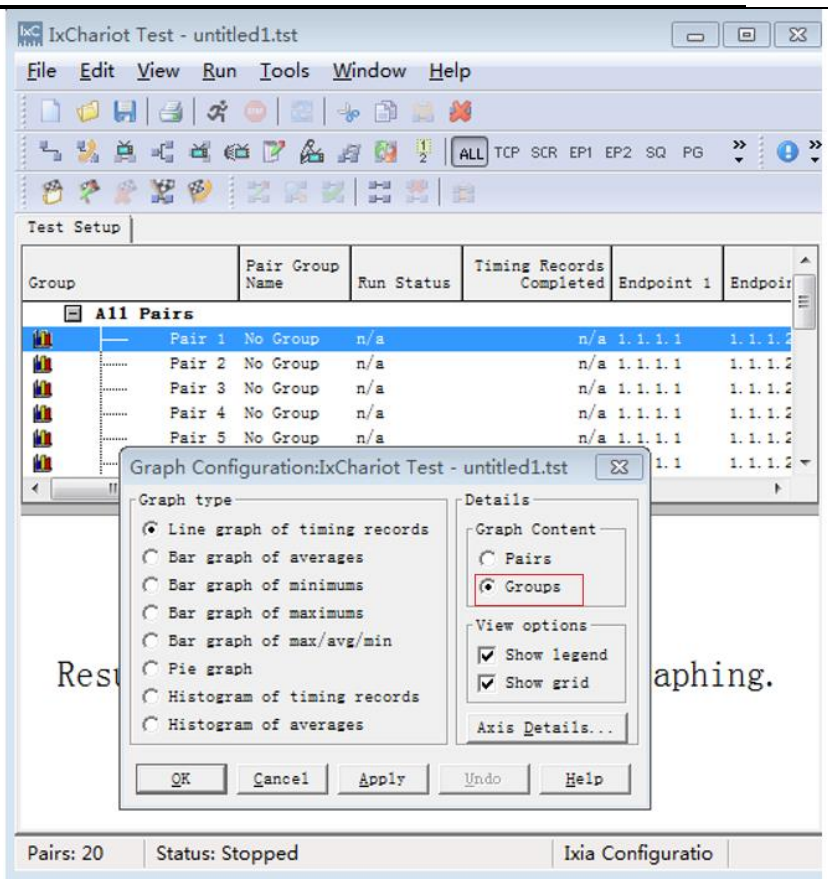


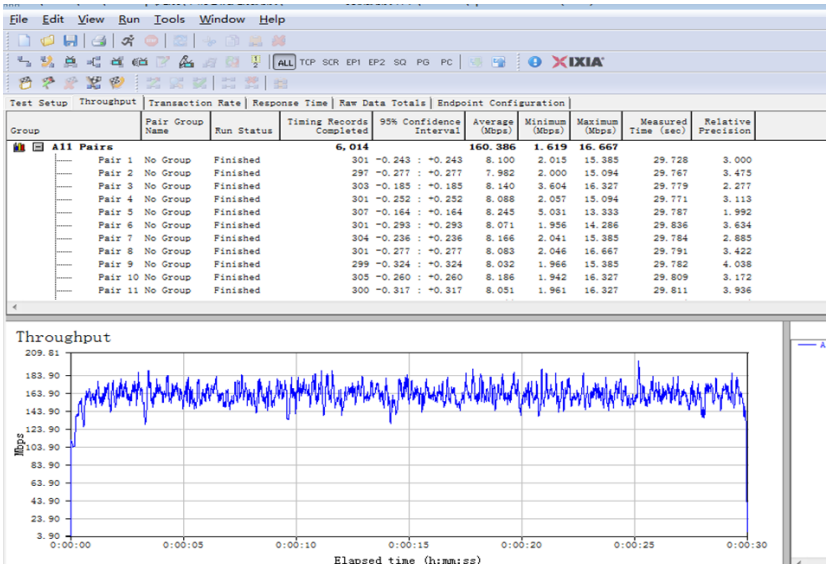
5. Set the test time as 1 min


IxChariot Test - untitled1.tst
File Edit View Run Tools Window Help
Run Ctrl+R
Stop Ctrl+T
Set Run Options...
Poll Endpoints Now F5
Test Setup
Group
Pair Group Name
Run Status
Timing Records Completed
Endpoint 1
All Pairs
Pair 1 No Group n/a n/a 1.1.1.1
Pair 2 No Group n/a n/a 1.1.1.1
Pair 3 No Group n/a n/a 1.1.1.1
Pair 4 No Group n/a n/a 1.1.1.1
Pair 5 No Group n/a n/a 1.1.1.1
Pair 6 No Group n/a n/a 1.1.1.1
Pair 7 No Group n/a n/a 1.1.1.1
Pair 8 No Group n/a n/a 1.1.1.1
Pair 9 No Group n/a n/a 1.1.1.1
Pair 10 No Group n/a n/a 1.1.1.1
Results are not available for



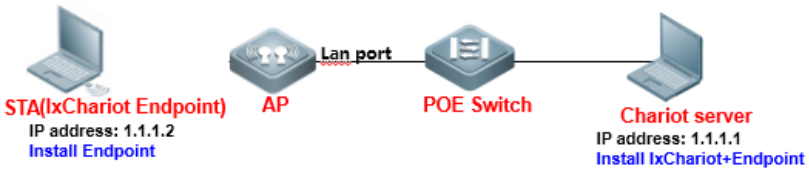
6. Right click to set the Graph Content as “Groups”

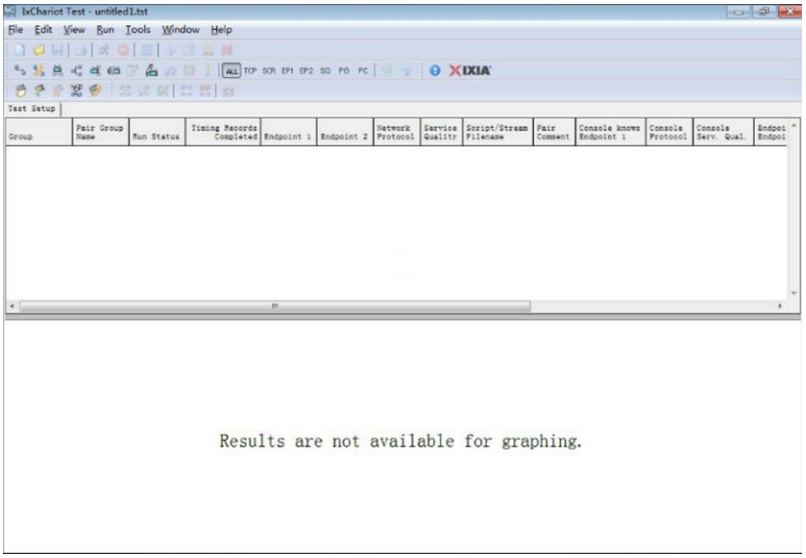
<table>
<tr>
<td></td>
<td>


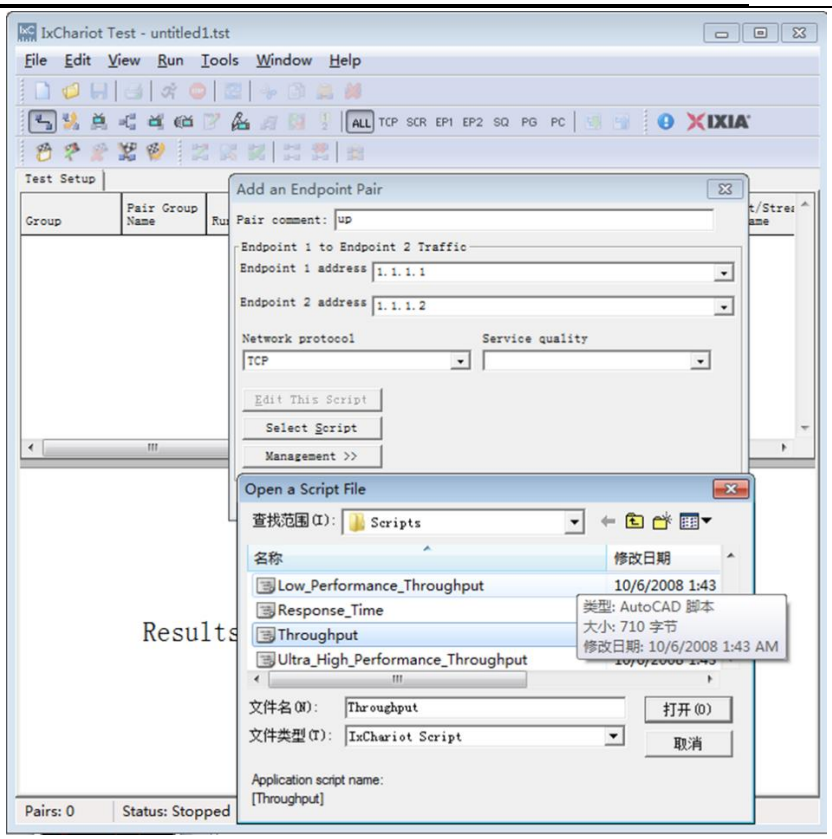
7.Click  to send date streams
</td>
</tr>
<tr>
<td>Expected Result:</td>
<td>
The max throughput of the AP radio will be tested


</td>
</tr>
<tr>
<td>Test Conclusion:</td>
<td></td>
</tr>
</table>

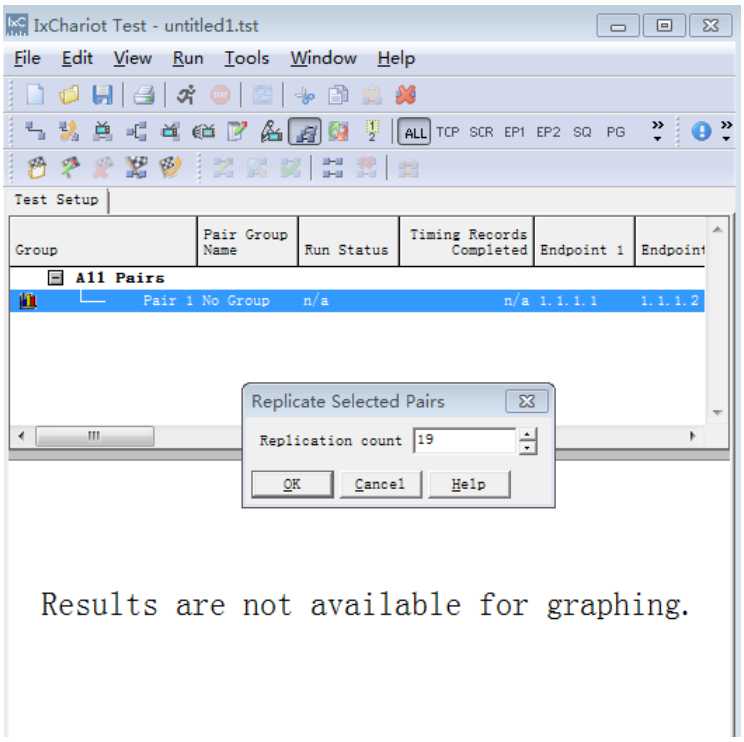
4.2 WiFi6 AP Throughput Performance

Test Item	WiFi6 AP Throughput Performance
Description	Test the AP's max throughput performance
Test Procedure	**Topology:**  **Procedure:** 1. Test Environment Check Use a signal scanning tool such as WirelessMon to scan the onsite environment. If the interference from other service set identifiers (SSIDs) is detected, these SSIDs should be turned off; if they cannot be turned off, the test should avoid the channel where a SSID of strong signal interference is located. Before the test, you can also use WirelessMon to scan the RSSI of the test SSID to ensure that the RSSI is not smaller than –55 dBm. When there is any interference in the test environment, configure the AP channel to the one with the smallest interference. AC#conf AC(config)#ap-config AP840----- The AP name is AP840. AC(config-ap)#channel 64 radio 2 AC(config-ap)#chan-width 80 radio 2 AC(config-ap)#11acsupport enable AC(config-ap)#11axsupport enable AC(config-ap)#end 2. Install IxChariot IxChariot is the industry's leading test tool for simulating real-world applications and assessing network performance in live networks. IxChariot uses distributed, low-profile endpoint to assess point to point performance and network capacity. It can be used to test the highest performance of an AP, thereby obtaining the its upstream and downstream throughput (official website of IxChariot: http://www.ixiacom.com). Components of IxChariot: ① IxChariot Console: It is installed in the Windows system to generate

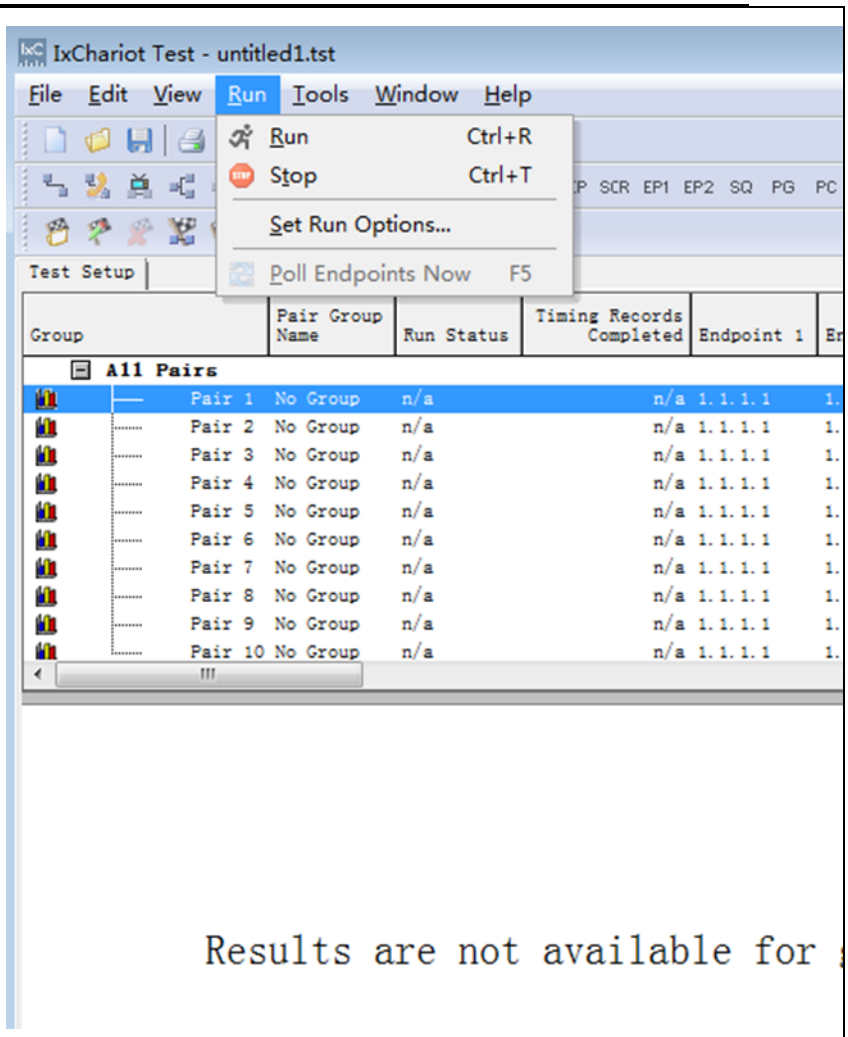
	and simulate traffic, and output the data simulation result. ② Endpoint: It is installed in the Windows system to send and receive traffic. Step1: Install IxChariot 6.7 (both the Console and Endpoint) on the server. Step2: Install Endpoint on STAs Step3: Start IxChariot  Note: On the server, you should ensure proper running of both the Console and Endpoint, but on an STA, you need to ensure only proper running of the Endpoint. 3. Create a downward data sending stream, and send data from Serve 1.1.1.1 to STA 1.1.1.2. Click  to add a pair.

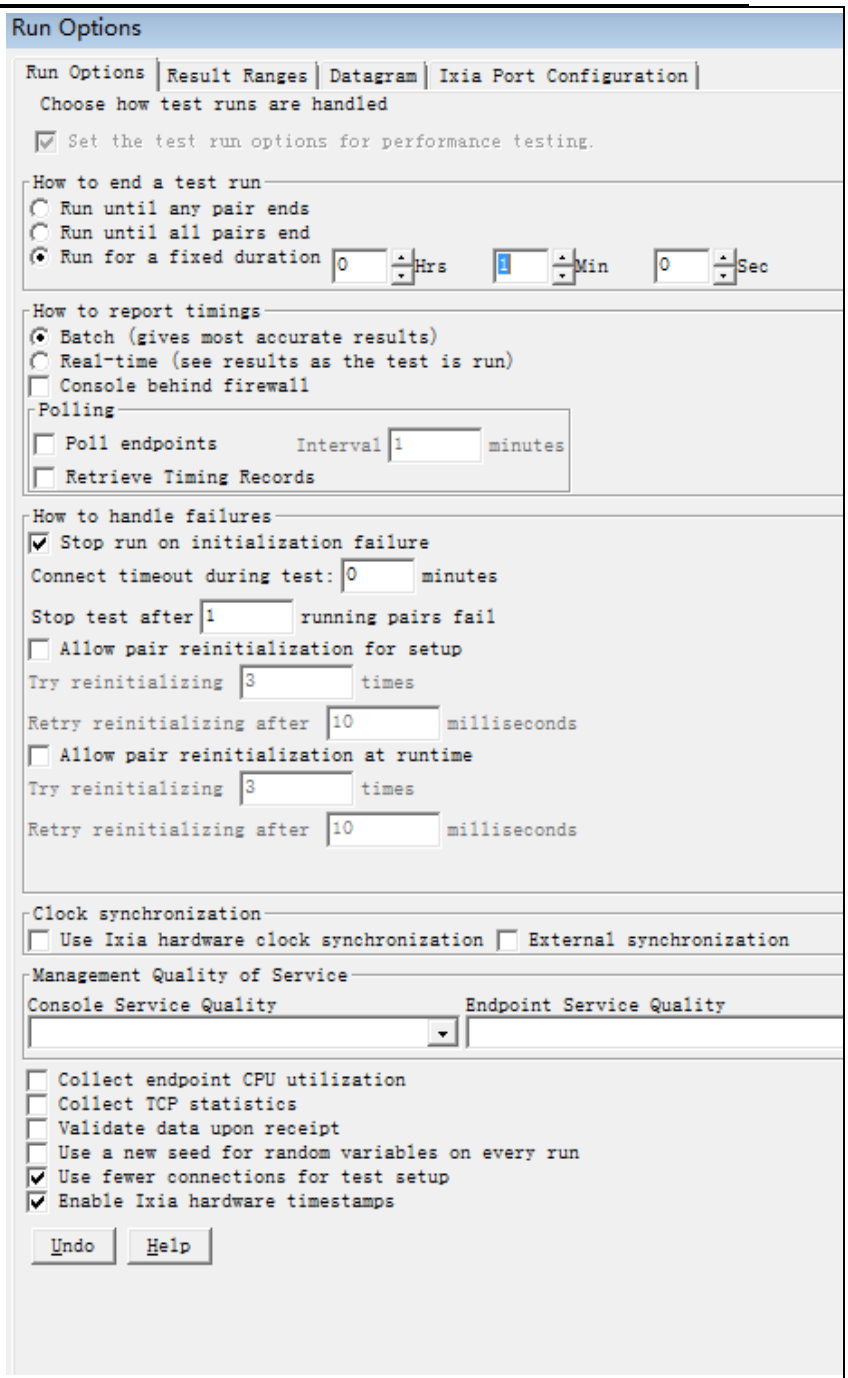


4. Create 20 data streams.

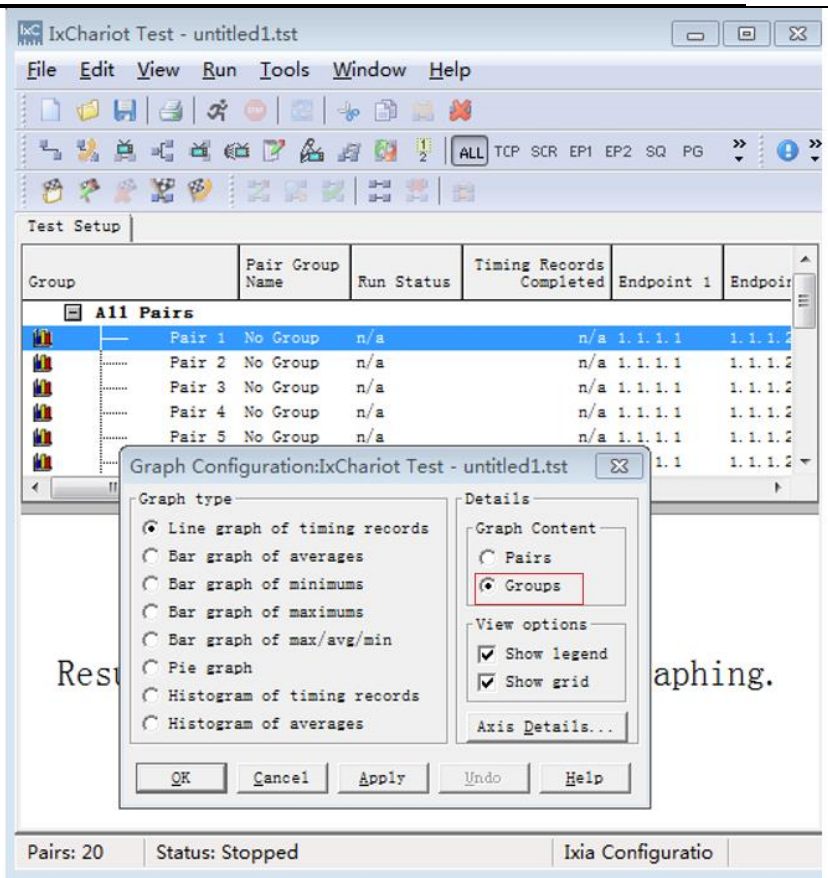
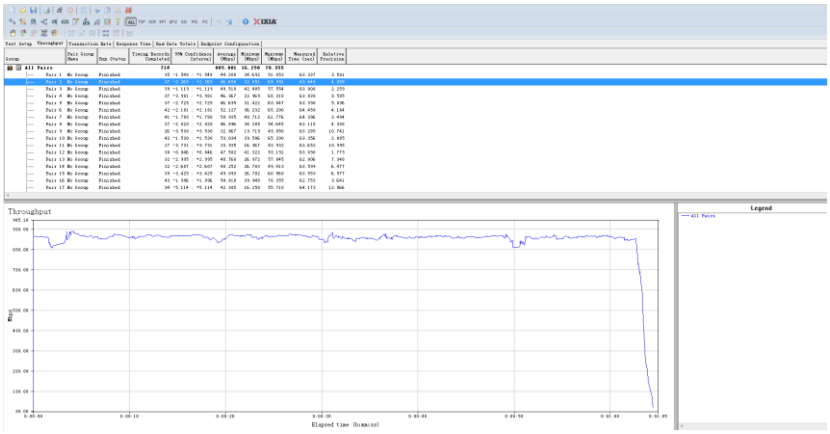


5. Set the test time as 1 min


IxChariot Test - untitled1.tst
File Edit View Run Tools Window Help
Run Ctrl+R
Stop Ctrl+T
Set Run Options...
Poll Endpoints Now F5
Test Setup
Group
Pair Group Name
Run Status
Timing Records Completed
Endpoint 1
All Pairs
Pair 1 No Group n/a n/a 1.1.1.1
Pair 2 No Group n/a n/a 1.1.1.1
Pair 3 No Group n/a n/a 1.1.1.1
Pair 4 No Group n/a n/a 1.1.1.1
Pair 5 No Group n/a n/a 1.1.1.1
Pair 6 No Group n/a n/a 1.1.1.1
Pair 7 No Group n/a n/a 1.1.1.1
Pair 8 No Group n/a n/a 1.1.1.1
Pair 9 No Group n/a n/a 1.1.1.1
Pair 10 No Group n/a n/a 1.1.1.1
Results are not available for

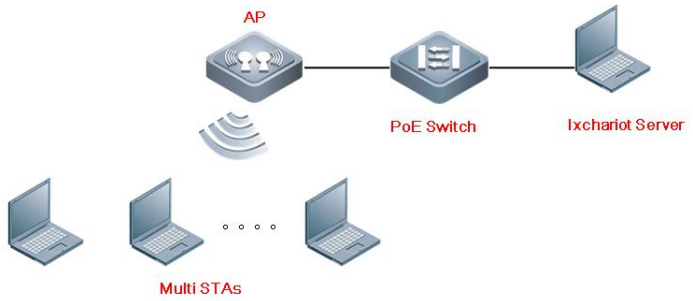


6. Right click to set the Graph Content as “Groups”

	 7.Click  to send date streams
Expected Result:	The max throughput of the AP radio will be tested 
Test Conclusion:	

4.3 Multi-Users Throughput Performance

Test Item	Multi-Users Throughput Performance
Description	Test the Multi-Users throughput performance
Test Procedure	**Topology:**



Procedure:

1. Test Environment Check

Use a signal scanning tool such as WirelessMon to scan the onsite environment. If the interference from other service set identifiers (SSIDs) is detected, these SSIDs should be turned off; if they cannot be turned off, the test should avoid the channel where a SSID of strong signal interference is located.

Before the test, you can also use WirelessMon to scan the RSSI of the test SSID to ensure that the RSSI is not smaller than –55 dBm.

When there is any interference in the test environment, configure the AP channel to the one with the smallest interference.

```
AC#conf
AC(config)#ap-config APXXX----- The AP name is APXXX.
AC(config-ap)#channel 149 radio 2
AC(config-ap)#chan-width 80
AC(config-ap)#end
```

2. Install IxChariot

IxChariot is the industry's leading test tool for simulating real-world applications and assessing network performance in live networks. IxChariot uses distributed, low-profile endpoint to assess point to point performance and network capacity. It can be used to test the highest performance of an AP, thereby obtaining the its upstream and downstream throughput (official website of IxChariot: http://www.ixiacom.com).

Components of IxChariot:

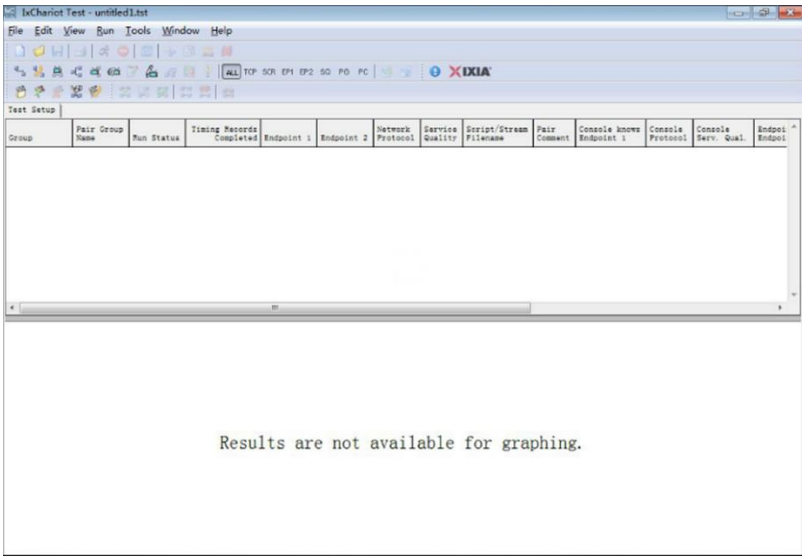
① IxChariot Console: It is installed in the Windows system to generate and simulate traffic, and output the data simulation result.

② Endpoint: It is installed in the Windows system to send and receive traffic.

Step1: Install IxChariot 6.7 (both the Console and Endpoint) on the server.

Step2: Install Endpoint on STAs

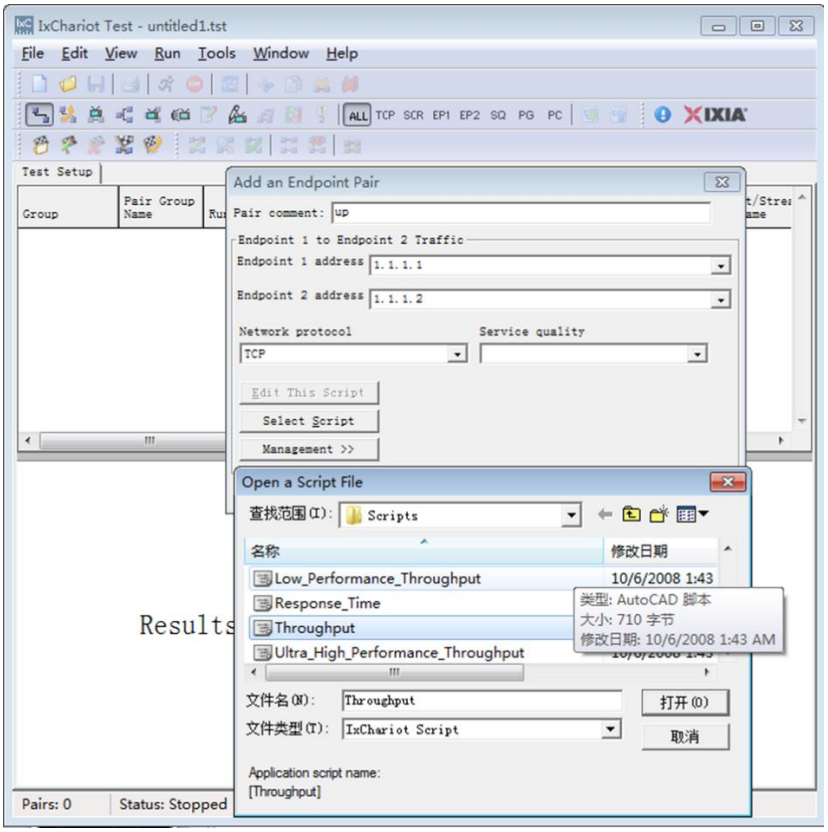
Step3: Start IxChariot

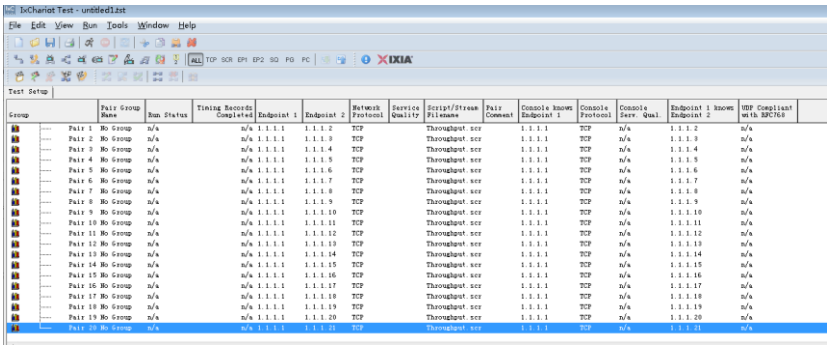


Note: On the server, you should ensure proper running of both the Console and Endpoint, but on an STA, you need to ensure only proper running of the Endpoint.

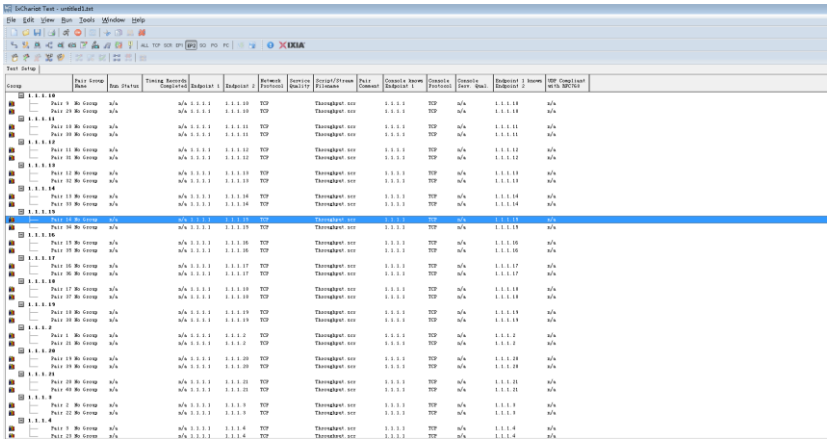
3. Create a downward data sending stream, and send data from Serve 1.1.1.1 to STA 1.1.1.2 -----> 1.1.1.41.

Click  to add a pair.

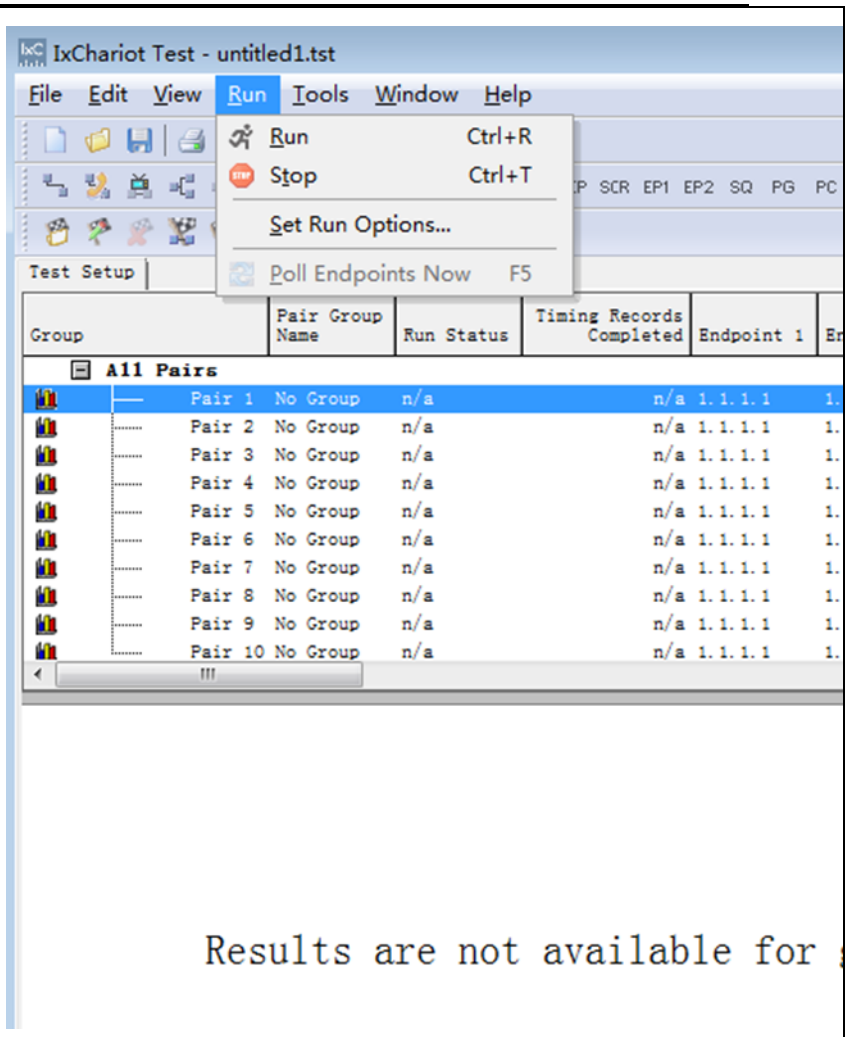


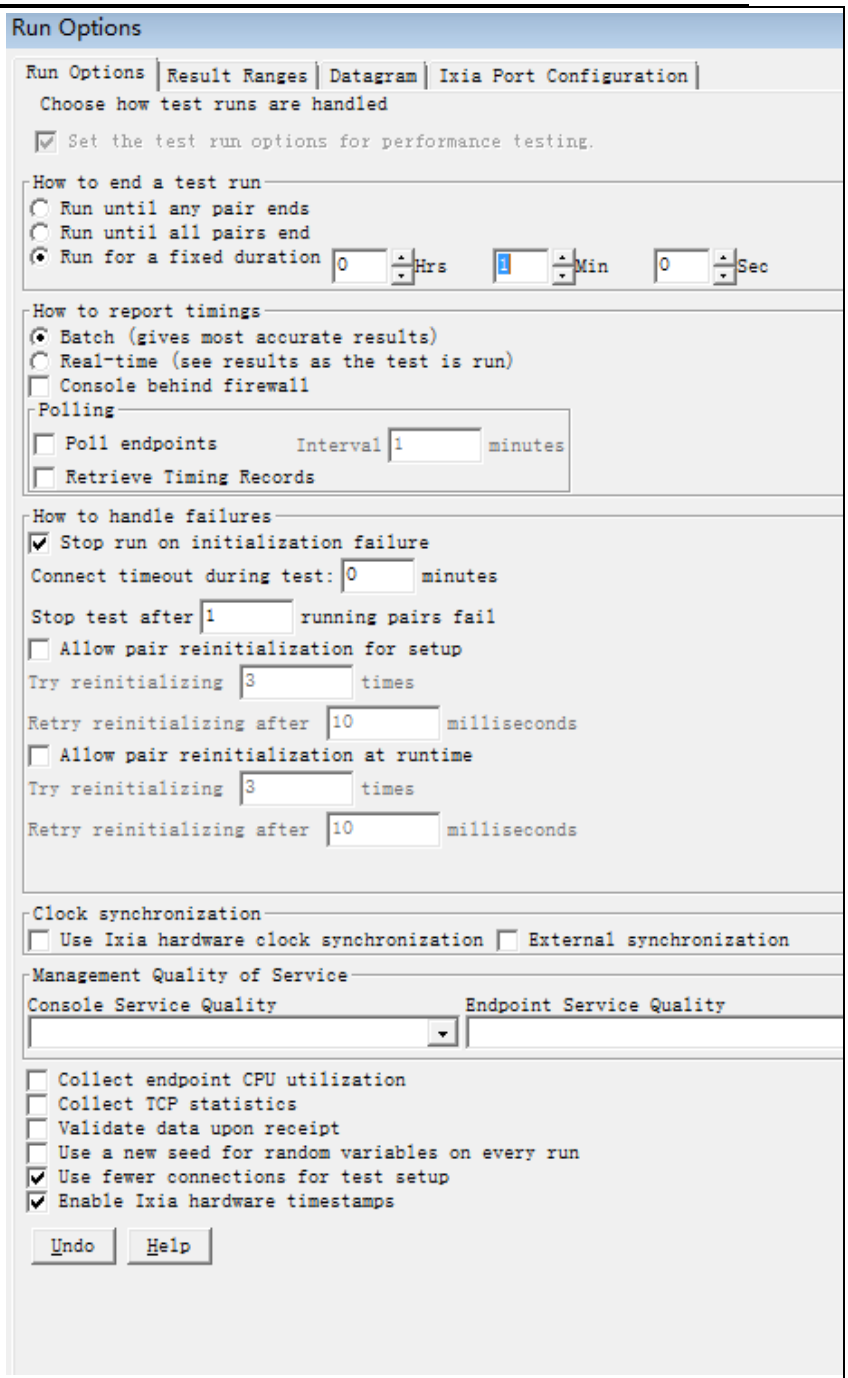


4. Create 2 data streams for each user.

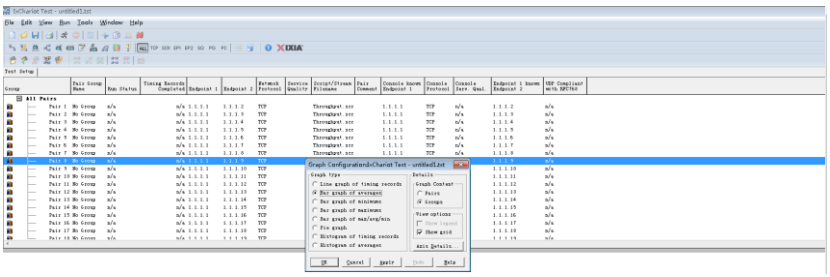


5. Set the test time as 1 min

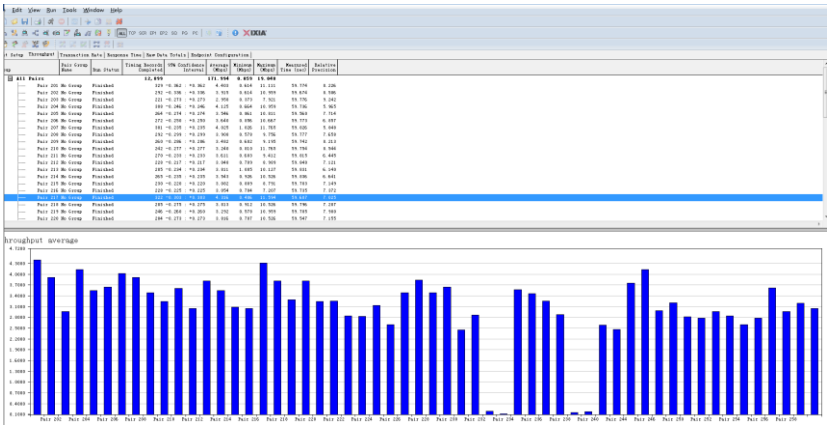

IxChariot Test - untitled1.tst
File Edit View Run Tools Window Help
Run Ctrl+R
Stop Ctrl+T
Set Run Options...
Poll Endpoints Now F5
Test Setup
Group
Pair Group Name
Run Status
Timing Records Completed
Endpoint 1
All Pairs
Pair 1 No Group n/a n/a 1.1.1.1
Pair 2 No Group n/a n/a 1.1.1.1
Pair 3 No Group n/a n/a 1.1.1.1
Pair 4 No Group n/a n/a 1.1.1.1
Pair 5 No Group n/a n/a 1.1.1.1
Pair 6 No Group n/a n/a 1.1.1.1
Pair 7 No Group n/a n/a 1.1.1.1
Pair 8 No Group n/a n/a 1.1.1.1
Pair 9 No Group n/a n/a 1.1.1.1
Pair 10 No Group n/a n/a 1.1.1.1
Results are not available for



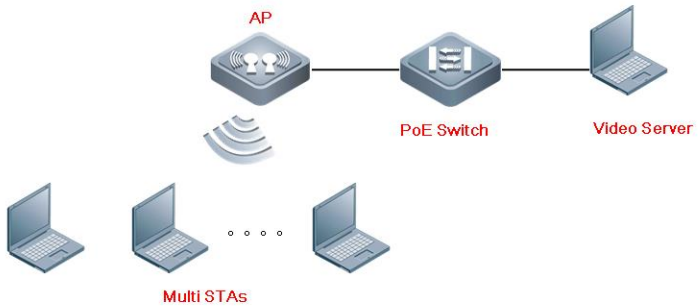
6. Right click to set the Graph Content as “Groups” and “Bar”



7.Click  to send date streams

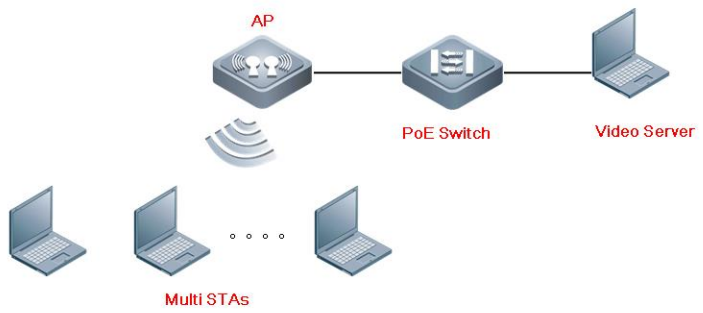
Expected Result:	The Multi-Users throughput of the AP will be tested 
Test Conclusion:	

4.4 Multi-Users Video Performance

Test Item	Multi-Users video performance
Description	Test the Multi-Users video performance
Test Procedure	**Topology:**  **Procedure:** 1. Test Environment Check When there is any interference in the test environment, configure the AP channel to the one with the smallest interference. Radio1 and Radio2 are in a ratio of 1:5, if the device is support Radio3, the scale is 1:5:5. AC#conf AC(config)#ap-config APXXX----- The AP name is APXXX. AC(config-ap)#channel 1 radio 1 AC(config-ap)#chan-width 20 radio 1 AC(config-ap)# sta-limit 5 radio 1 AC(config-ap)#channel 149 radio 2

	AC(config-ap)#chan-width 80 radio 1 AC(config-ap)# sta-limit 25 radio 2 AC(config-ap)#end 2. Open all the test devices, connect to the SSID. Check all devices connect succeed with Eweb or CLi command. 3. All STAs access the video on the video server at the same time, record the experience. 4. All STAs access to the video website, access the same video at the same time.
Expected Result:	The Multi-Users video performance of the AP will be tested
Test Conclusion:	

4.5 Dual 5G Mode Test

Test Item	Dual 5G Test
Description	Test Dual 5G, AP820-L V2 support change the Radio1 to 5G
Test Procedure	**Topology:**  **Procedure:** 1. Test Environment Check Change the Radio1 to 5G AP#conf AP(config)#interface dot 1/0 AP(config-ap)#radio-type 802.11a AP(config-ap)#chan-width 80 AP(config-ap)#channel 149 AP(config-ap)#exit AP(config)#interface dot 2/0

	AP(config-ap)#channel 64 AP(config-ap)#chan-width 80 AP(config-ap)#end 2. Open the WiFi MoHo to check the AP have dual 5G SSID. 3. Connect to the SSID, check the negotiate rate and do the speedtest.
Expected Result:	The Radio1 support change to 5G
Test Conclusion:	