
Ruijie WIS Deployment and Implementation Guide V3.2



Ruijie Networks Co., Ltd.

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Contents

1. About WIS

1.1 Overview

WIS is short for the wireless intelligent service.

1.2 WIS Components

WIS Official Website

The WIS official website refers to the WIS operation center. The WIS official website provides the latest information and updates of the WIS product family, product forum, client project management center, and data transfer station.

Tips: The WIS official website is used for client management/project management/report query/WIS product value delivery.

WIS

WIS is a set of wireless intelligent operation and maintenance (O&M) solutions. It provides complete O&M services for excellent wireless network experience, including a single client view and hierarchical views of operation investors. It provides various one-click functions, such as preview, health check, diagnosis, optimization, reports, defense, and upgrade. WIS meets all requirements from delivery to preventive O&M and presentation.

Tips: WIS is used in project delivery and O&M stages. It can be deployed in the cloud.

1.3 WIS

Overview

WIS is a unique O&M system for wireless networks, which focuses on the ultimate user experience.

WIS can:

- Visualize wireless networks and automatically optimize them.
- Follow the Internet and industry trends and renovate the interaction manner.

- Support mobile O&M by Apps.
- Allow self-definition.

WIS simplifies network O&M, and enables convenient network O&M for infinite possibilities.



WIS Design Philosophy

Intelligent O&M



Devoted to ultimate user experience



Visualized network and experience

Visualization becomes the dominant requirement due to uncertainty and instability of wireless networks. Different from the conventional management software, WIS manages and visualizes user experience instead of devices and topologies.



Environment awareness and automatic optimization

Quantification of network environment and user experience enables WIS to perceive network changes, automatically and continuously optimizes networks, and guides clients for optimal access and roaming.



Network-wide cloudification and innovative interaction

Cloud enables real-time and integral information. Therefore, intelligent algorithms can be applied to improve wireless experience. Wireless access to the cloud network enables more intelligent and automatic optimization. Moreover, interaction via WeChat and Apps are supported.

Ruijie 锐捷

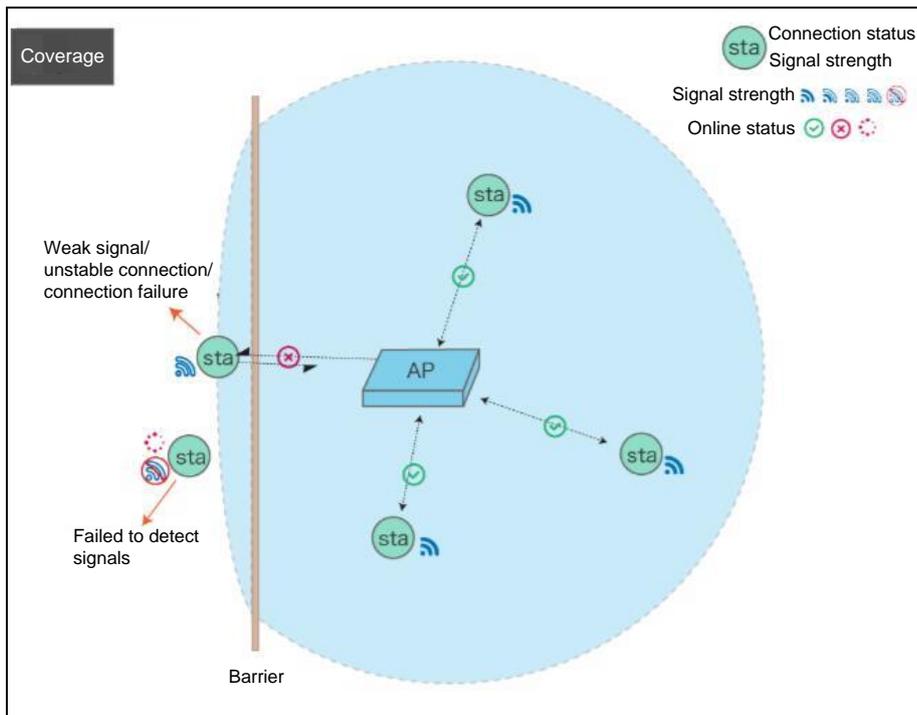
Challenges Confronted by WIS

During O&M, WIS is confronted by challenges concerning technologies, real-timeness, and reports.

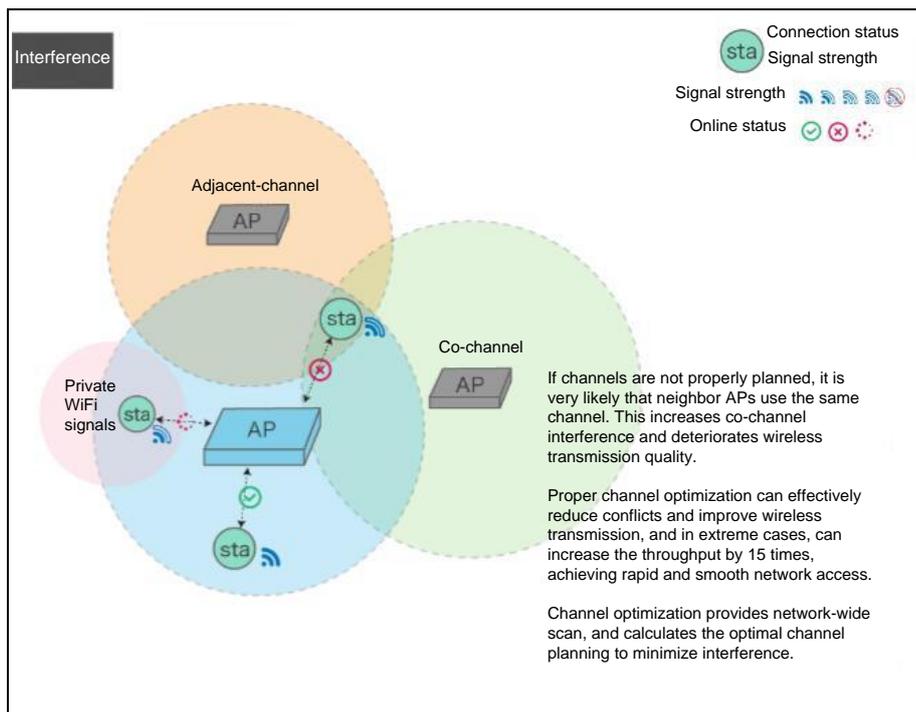
➤ WIS solution to challenges concerning technologies

The difficulty of wireless networks mainly lies in their uncertainty and instability, including the following five challenges:

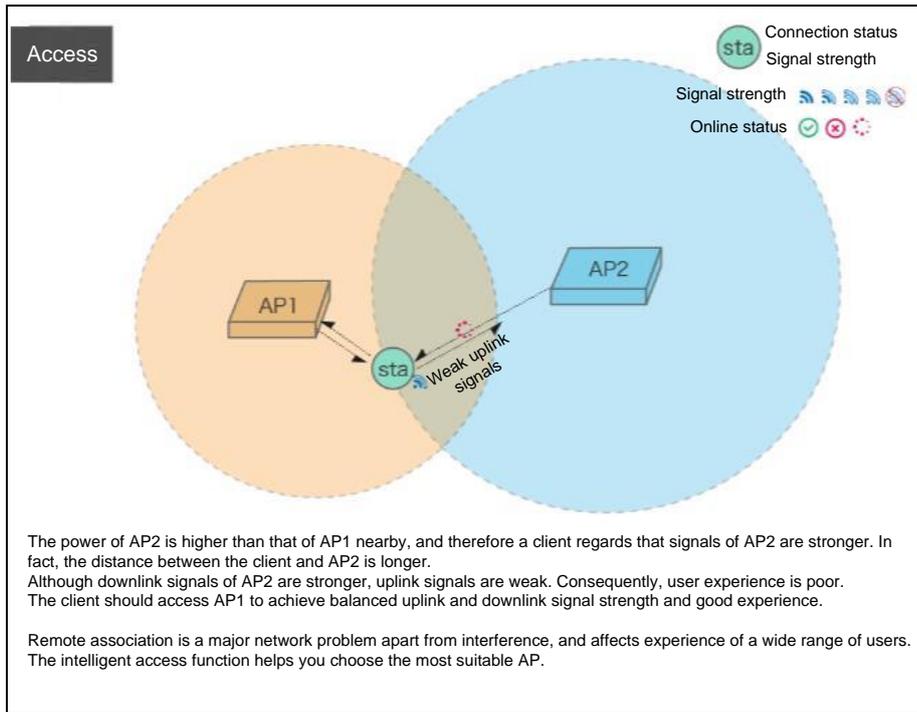
1. Coverage holes are caused by uncertain coverage range of wireless signals.



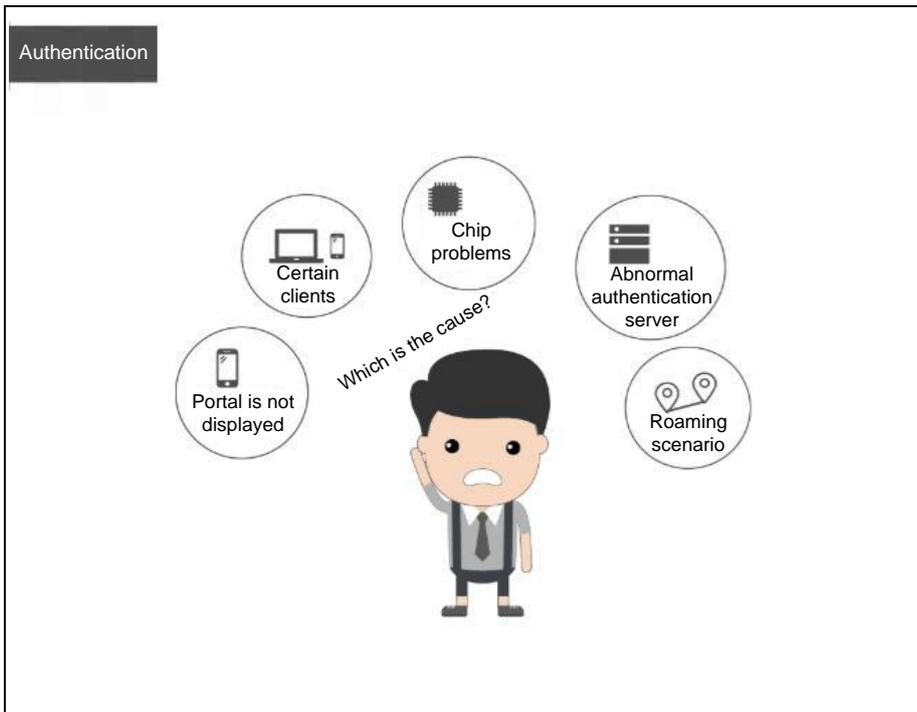
2. Interference is caused by band sharing.



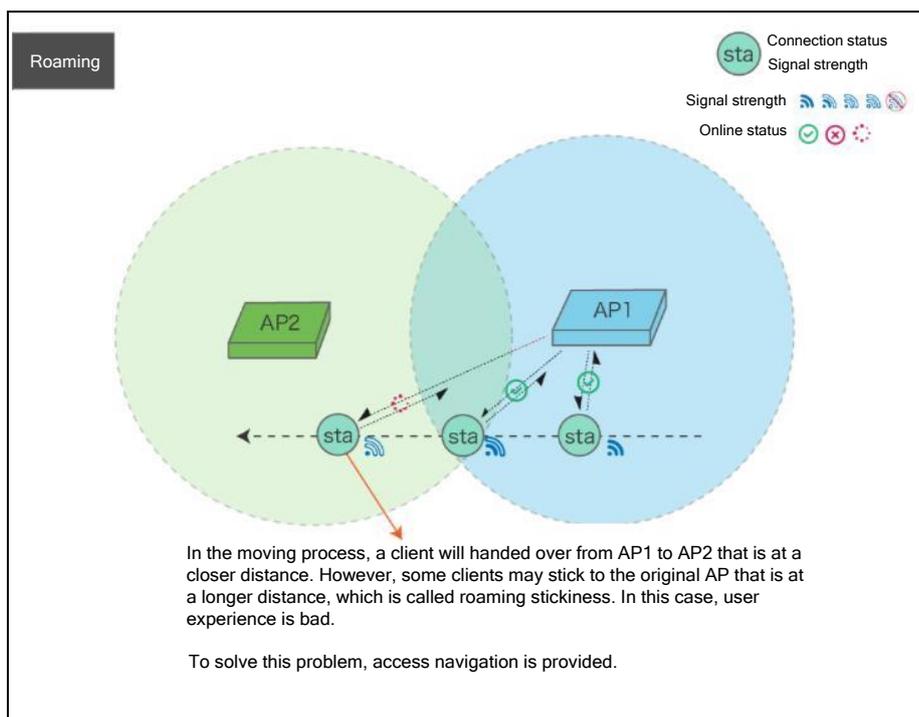
3. Access to an inappropriate AP is caused due to client difference and personalization, as the client can choose the AP to be accessed.



- Authentication failures are caused by the open communication environment and different authentication manners of vendors.



- Roaming failures are caused by the nature of mobility.



WIS provides targeted solutions to the preceding five challenges. For details, see Chapter 4.

➤ WIS solution to challenges concerning real-time network problem discovery

WIS collects data about user experience and running status of the network-wide devices in real time. In addition, WIS allows self-definition of problem reporting rules.

➤ WIS solution to challenges concerning O&M reports

The O&M report includes the routine network running report and network optimization report.

The detailed report can be displayed and exported from the report module of WIS. It covers information such as the network device scale, client scale, rough client distribution, peak hours, and basic status of wireless experience. After the network is optimized, a report about the comparison between the effects before and after optimization is automatically generated.

2. WIS Deployment

2.1 WIS Support Status

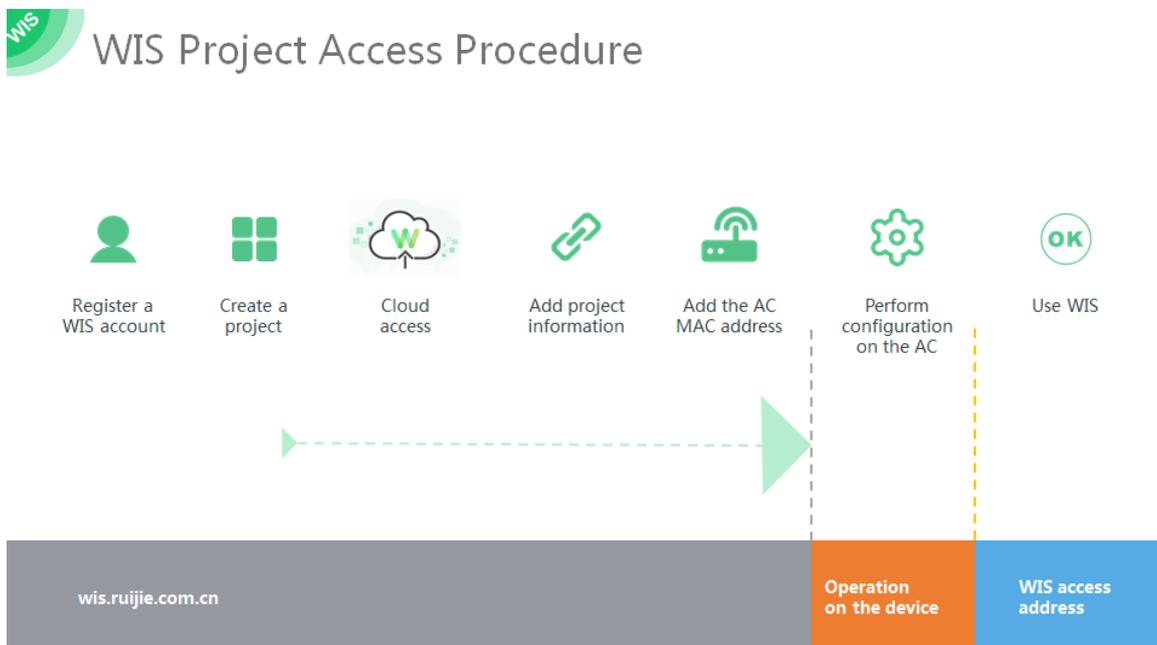
Version (11.X)	Release Status	WIS Support Status
d11.1(5)B7	Official release	WIS1.0 can be fully deployed. WIS2.0 is not supported. The WIS is not supported by AP110, AP220-E, AP220-E(M), AP220-SE, AP220-SH, AP220-SH, AP620-h, and AP5280.

11.1(5)B8	Official release	Both WIS1.0 and WIS2.0 can be fully deployed. The WIS is not supported by AP110-W, AP220-E v1.1, AP220-E(M) v1.5, AP220-SE v1.1, AP220-SH v1.1, and RG-AW322 v1.0.
11.1(5)B9	Pilot release	Both WIS1.0 and WIS2.0 can be fully deployed. The WIS is supported by all new products, but is not supported by AP110-W, AP220-E v1.1, AP220-E(M) v1.5, AP220-SE v1.1, AP220-SH v1.1, and RG-AW322 v1.0.
11.1(5)B23	Pilot release	Both WIS1.0 and WIS2.0 can be fully deployed. The WIS is not supported by RAP100 v1.00, RAP110 v1.00, RAP210 v1.00, and RAP210(E) v1.00.
11.1(5)B22	Official release	Both WIS1.0 and WIS2.0 can be fully deployed.

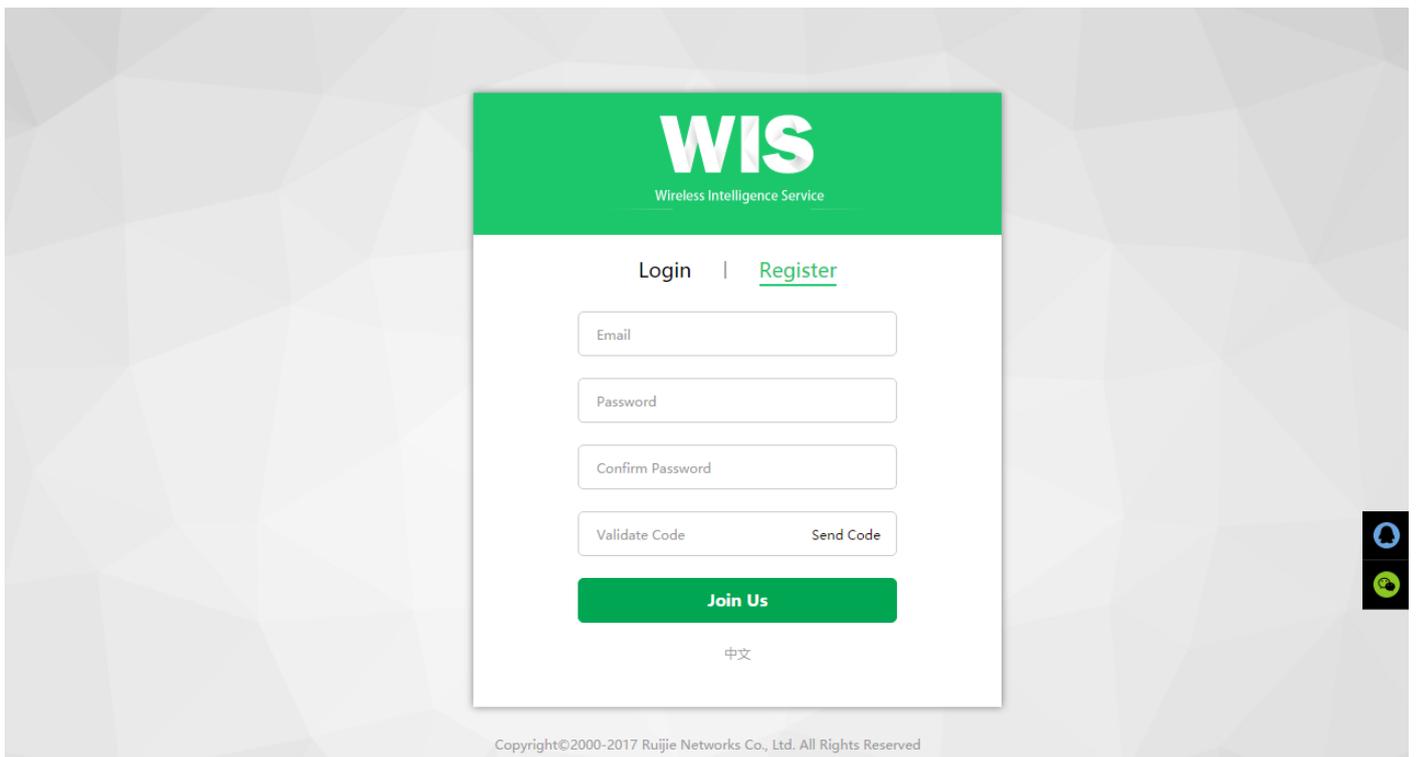
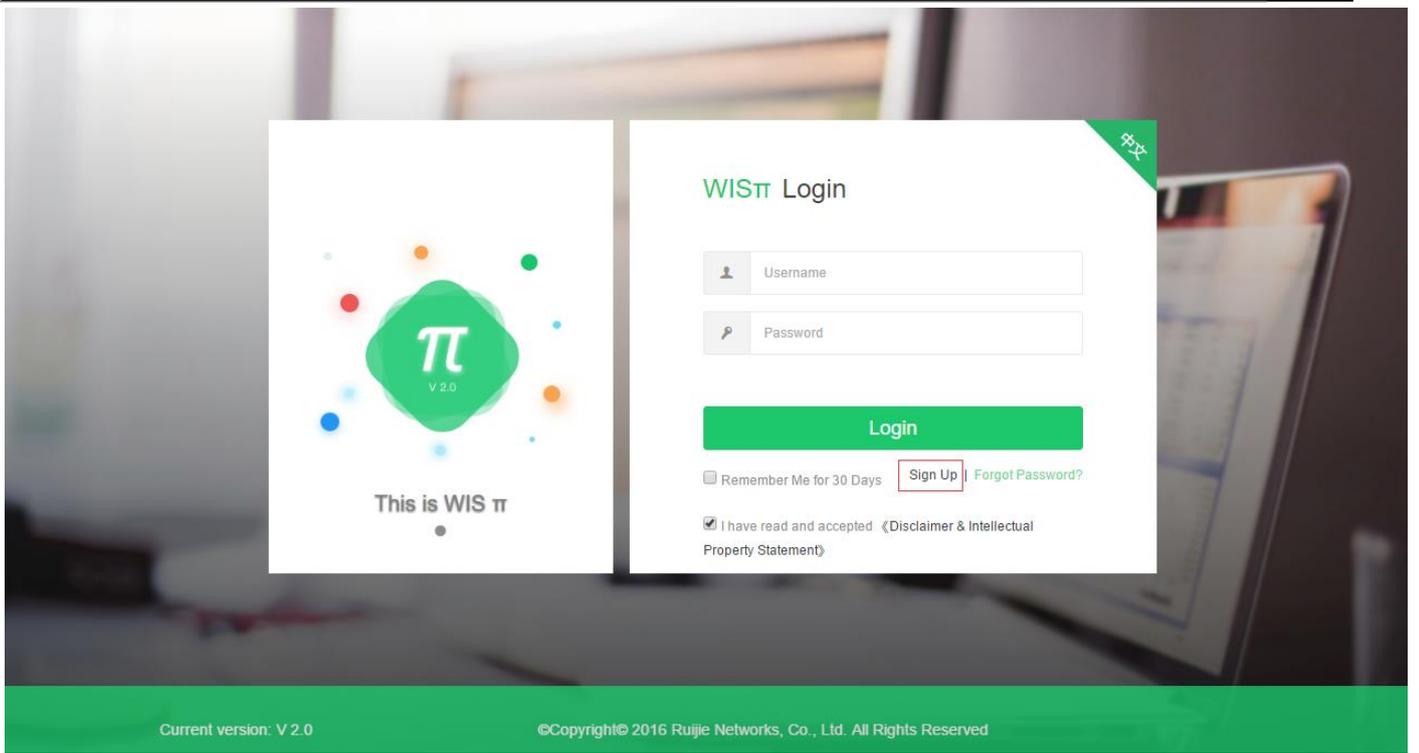
2.2 Access to WIS

2.2.1 Access Procedure

The following figure shows the WIS access procedure.



1. Register a WIS account by accessing our official website: wis.ruijienetworks.com (Chrome browser is recommended)



2.Create a project:



Welcome to WIS!

You are allowed to access the following products!

WISπ

Cloud Delivery, Cloud
O&M, Cloud Check,
Cloud Diagnosis

Create Project



New Project

Example 233

Add Project Member

You can add or invite project members. Only project members of the team can access the project information.

Team Member

Enter a username/Email/mo



Create

Nick@ruijiene...

Save

Cancel



Add Administrator

1.Members can apply to the project creator for administrator permissions

Members choose Bench > My Projects to apply for permissions;

The project manager chooses Application > Application Review to approve the application

2.The administrator can specify a member as an administrator

The administrator chooses Bench > My Projects > Member to specify an administrator



This project is created!

[connect this project](#)[Back](#)

3. Connect the project :

[Back](#) **Example 233**

1 — 2 — 3 — 4

Connection Info Add AC Connect to WISr Finish

Customer

Country

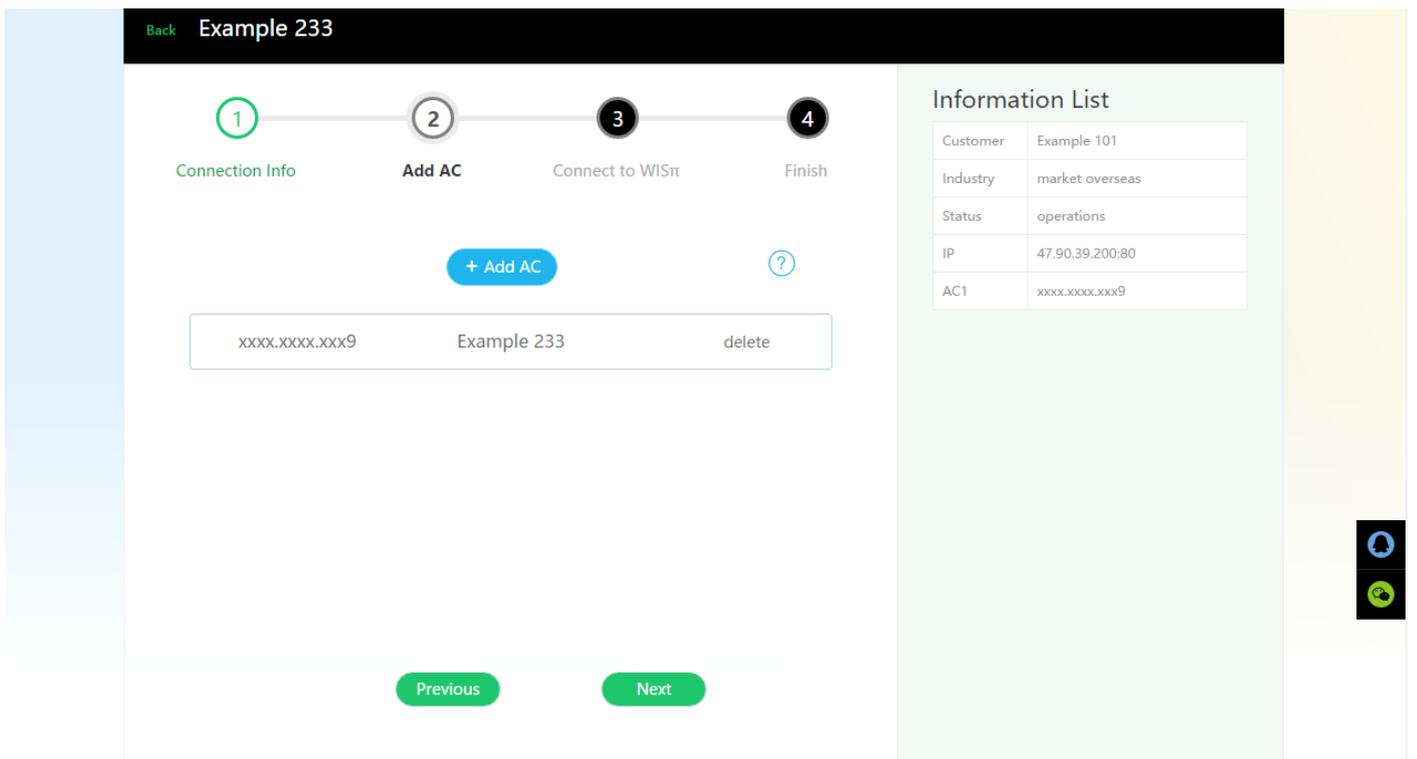
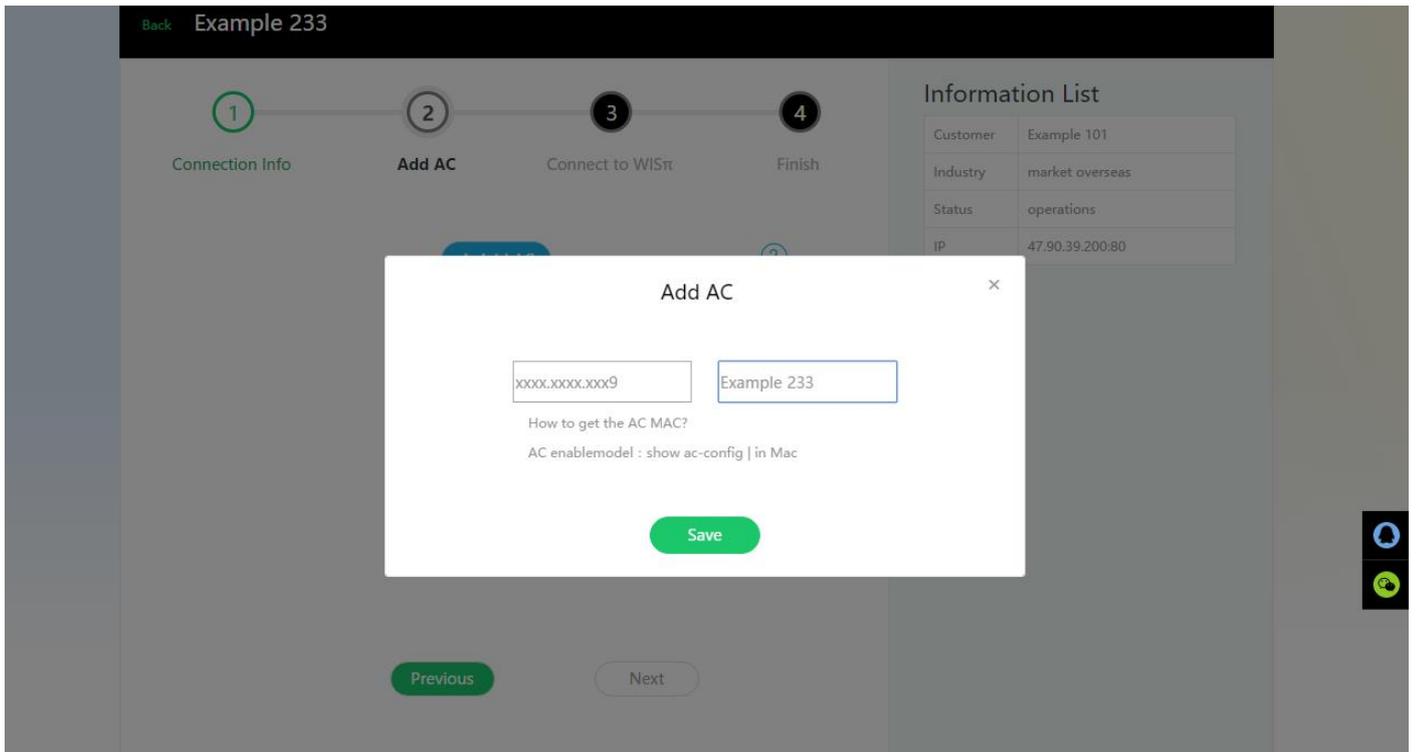
IP

[Previous](#) [Next](#)

Information List

Customer	Example 101
Industry	market overseas
Status	operations
IP	47.90.39.200:80

4. Add the MAC Address of AC



5. Copy the following commands to AC:



Copy the following configuration to AC:

```
end
config
wis enable
wis server-url http://47.90.39.200:80
ac-controller
wqos fs enable
end
write
```

Copy

Previous

done

Information List

Customer	Example 101
Industry	market overseas
Status	operations
IP	47.90.39.200:80
AC1	xxxx.xxxx.xxx9

6.Complete. The project date will be sent to WIS platform in a hour. Then you can access WIS platform (<http://wis.ruijientworks.com>) to use it



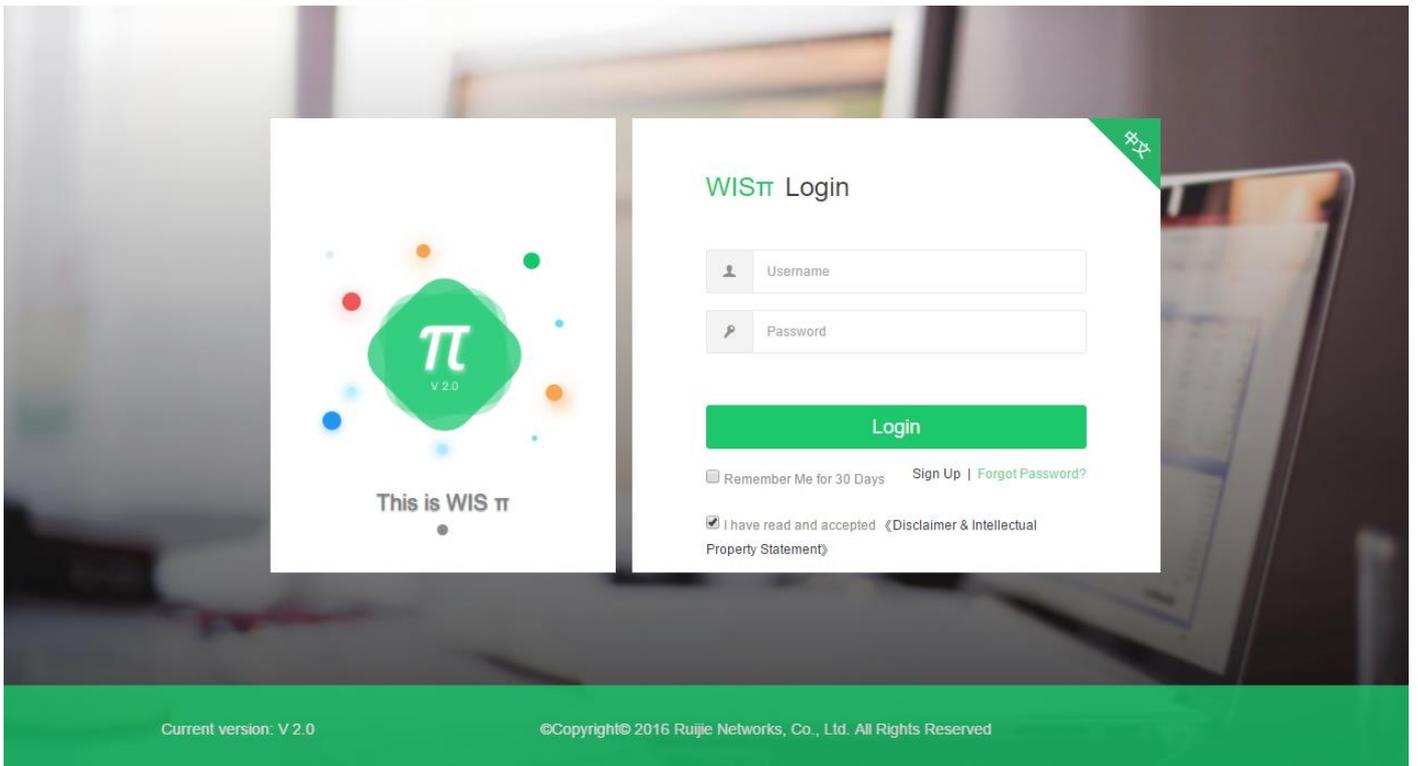
Connection succeeded !

Data will be sent to WISπ an hour later.

You can do the following :

- 1.Access WISπ at <http://wis.ruijienetworks.com/login?lang=en>, and enter your account to use WISπ.

Back



2.3 Bandwidth Required by WIS

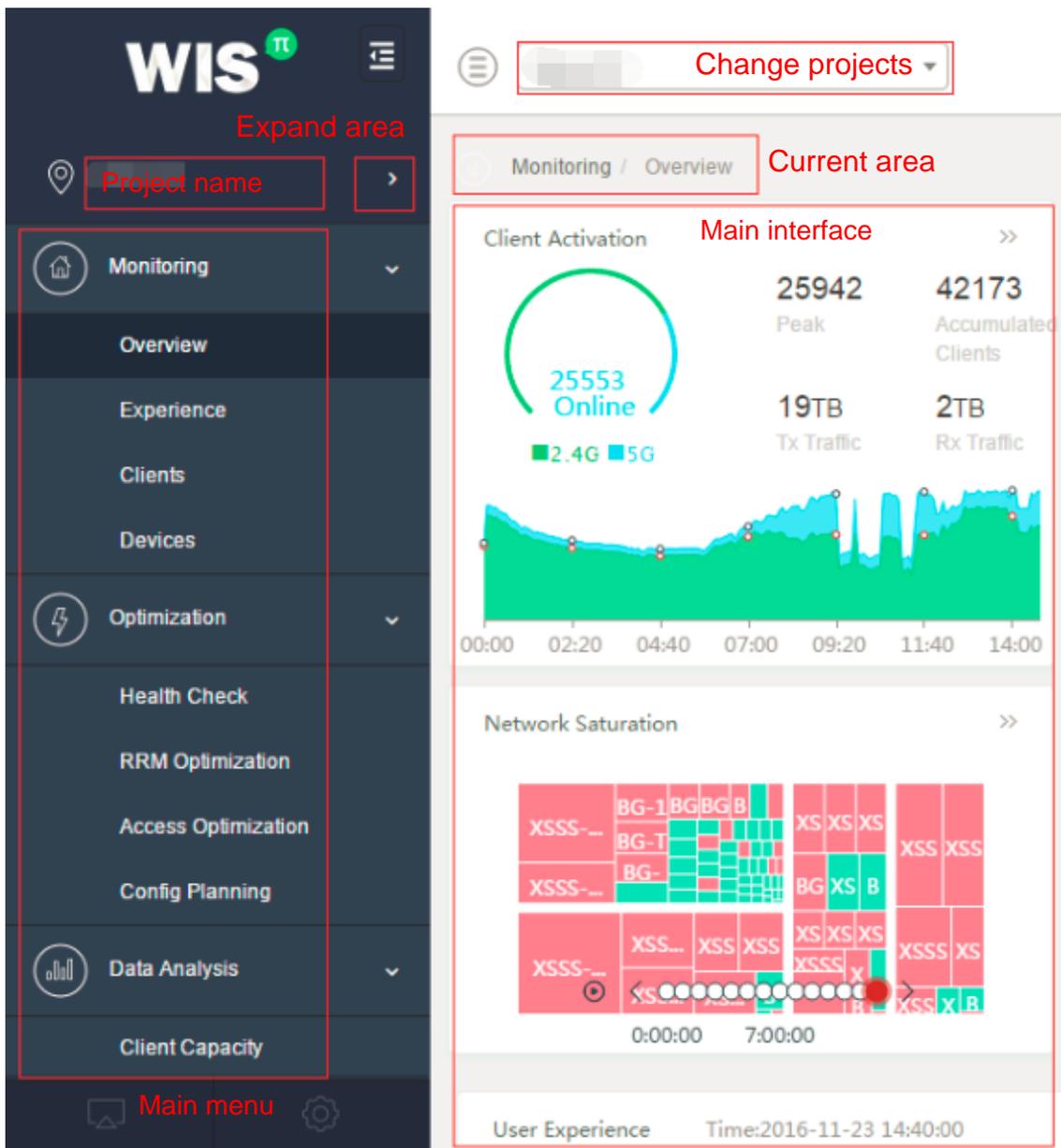
Scale	Peak Data Volume (Within 5 Minutes)	Average Bandwidth in Peak Hours	Weekly Average Bandwidth
5,000 client AC→Server	7.2 MB	200 kbps	30 kbps
20 client AP→AC	21 KB	560 bps	100 bps

3. WIS Navigation

3.1 Navigation Views

You can access the WIS system on Web portal five minutes after basic configuration of the WIS system is completed.

3.1.1 View Elements



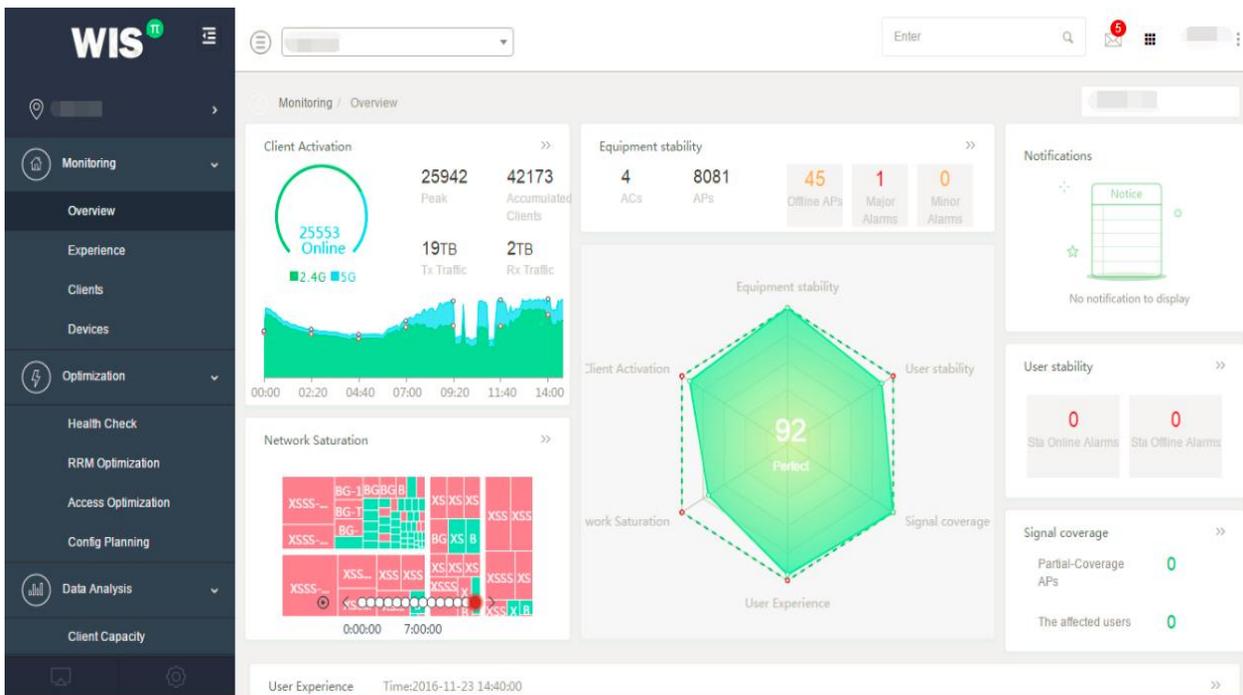
The navigation pane on the left displays the information about the entire network by default. Click the expand area button to specify an area. Areas are automatically classified by the AP group and AP name and can be manually adjusted in the background.

The drop-down list box on the top of the right area allows you to switch between project views.

The main interface on the right displays a corresponding view according to the function selected on the main menu on the left.

3.1.2 Overview

This section describes how to assess a wireless network from different dimensions and how to discover possible network problems.



The **Overview** page presents the overall network status and current network scores.

On the **Overview** page, you can learn about:

- Basic network status: including the equipment stability, user stability, and signal coverage
- Client use status: including the client activation (network dependency), and online experience and analysis
- Network saturation: including the network capacity utilization and channel usage
- Notifications: including notifications of emergencies You can access the details page from the overview of each dimension.

Note: Wireless networks are assessed from three major dimensions (six refined dimensions).

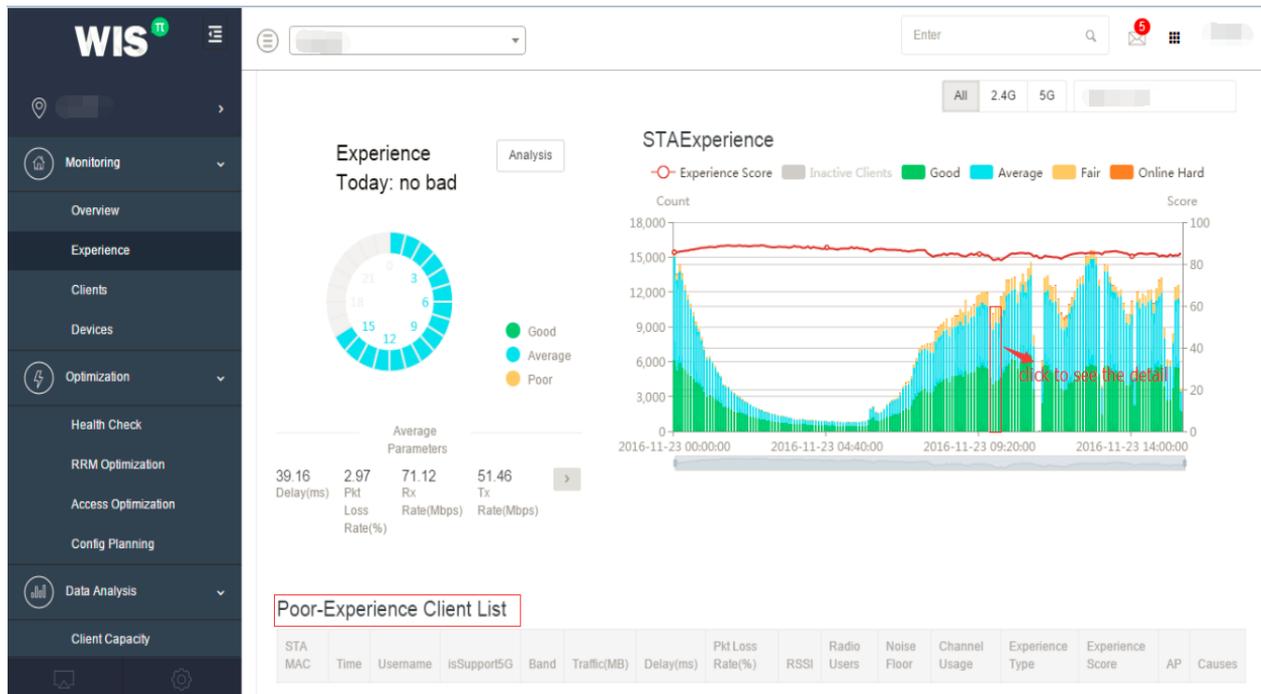
<p>Basic Network Status</p>	<p>Helps you learn about the equipment stability and user stability, so as to determine the stability of wired and wireless lines and whether there are poor coverage areas with high network requirements, thereby providing effective basis for device supplement.</p>
<p>Client Use Status</p>	<p>Helps you assess client dependency on the wireless network by time and traffic. It displays values of the wireless network construction in an intuitive way. User experience is graded into Good, Average, Fair, Online Hard, and Inactive Clients based on the packet loss rate, delay, and traffic data. You can assess the user experience of the entire network according to portions of the five user</p>

	experience levels and locate causes for poor experience.
Network Saturation	Helps you learn about client distribution of each area intuitively via the network capacity utilization, and find out busy areas at each time point and channel usage of each area, thereby providing basis for network deployment and optimization.

The data of the overall network is classified into experience, client, and equipment data. The following describes the **Experience, Clients** and **Devices** sub pages.

Notes: The update frequency of each type of data varies with requirements. For example, the online client quantity is updated every five minutes. **Accumulated Clients, Peak, Tx. Traffic, and Rx.Traffic** are statistics of the current day. Experience data is updated every five minutes. Client activation data is updated every hour. For details, see the attached table.

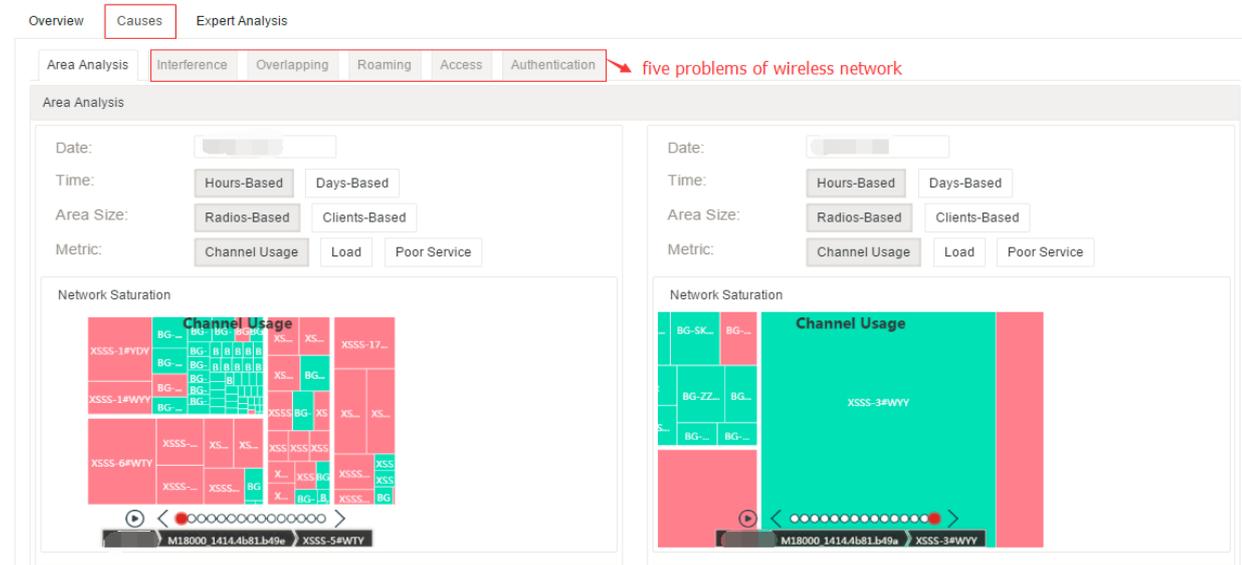
Experience



➤ **Overview:** Displays user experience assessment and user experience distribution of every hour in one day. Click the experience distribution chart to view the details of the clients with poor experience, including basic data and major cause analysis.

Experience measurement is the fundamental function of WIS. WIS employs the machine-learning algorithm to assess the user experience based on various types of indicators and parameters involved in the communication process of each client that accesses the wireless network. The parameters include signal strength, delay, packet loss, traffic, channel quality, and access process. The user experience is graded into **Good, Average, Fair, Online Hard, and Inactive Clients. Online Hard**

means that even the text applications requiring minimum resources cannot be used smoothly, and the experience is poor. Click the chart to display the list of the clients with poor experience. The user experience is measured every five minutes.



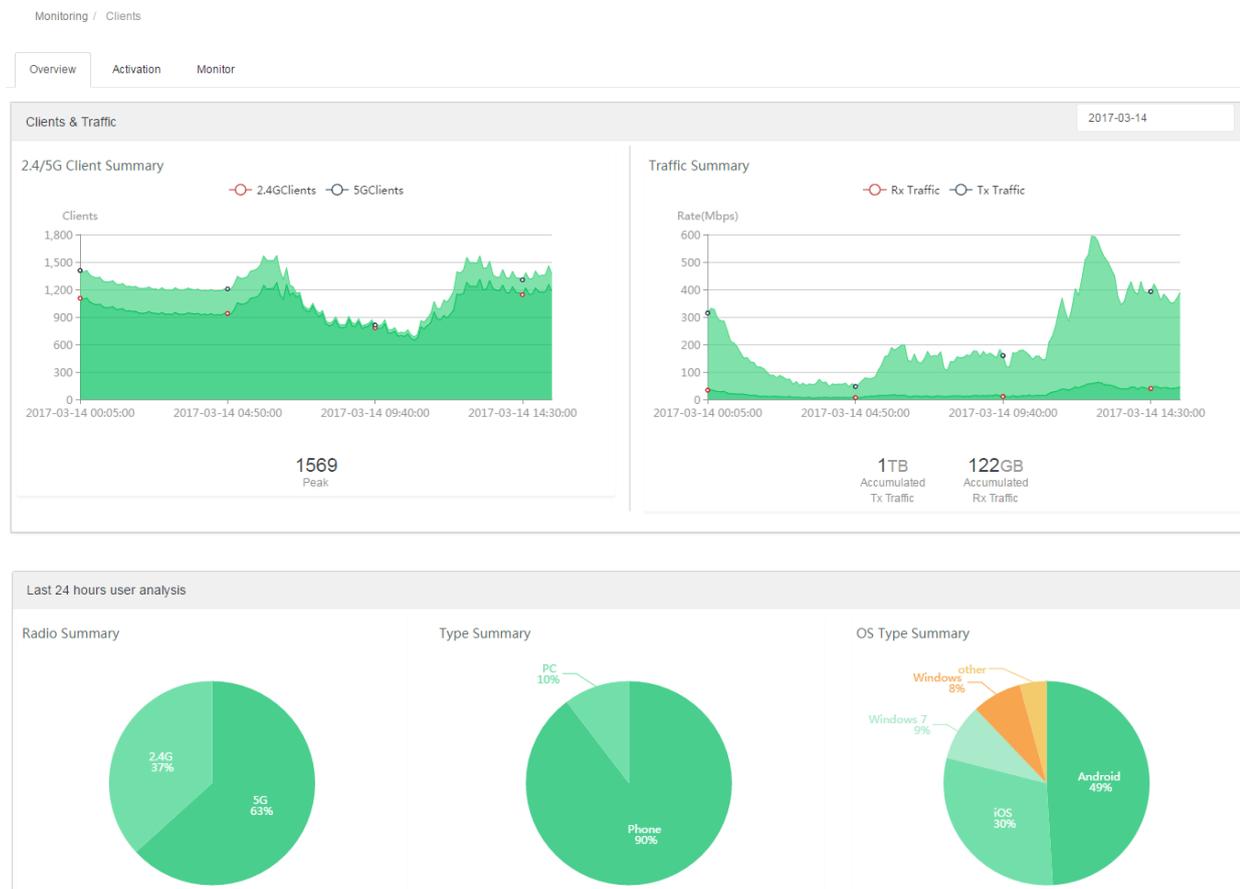
- **Causes:** Provides detailed analysis on the five aspects that affect user experience of the wireless network, including interference, coverage, roaming, access, and authentication. The preceding figure shows the signal interference. For other views, refer to WIS GUIs.

Five Aspects Affecting User Experience	
Interference	Shows the signal interference of the local network and other networks and the impact with reference to the channel usage and current client traffic, so as to find out busy channels. In the channel usage diagram, the y-axis indicates channel and the x-axis indicates time, to display the hourly channel status. The network saturation diagram displays the percentages of private signals of the local network and other networks. The interference diagram displays the interference caused by the private Wi-Fi signals to the network. The density of the private Wi-Fi signals indicates the interference severity. The statistics of private Wi-Fi signals can be obtained only after Gentle Scan is enabled.
Coverage	Displays signal coverage of each area. The coverage status is graded into Good , Average , and Fair . You can select an area with a coverage problem to display the coverage status of the whole day and details about the AP that generates the coverage problem at a certain moment. In this way, you can find out the areas with poor coverage and the number of the affected clients.
Roaming	Displays the percentage of clients confronted by roaming stickiness in the moving

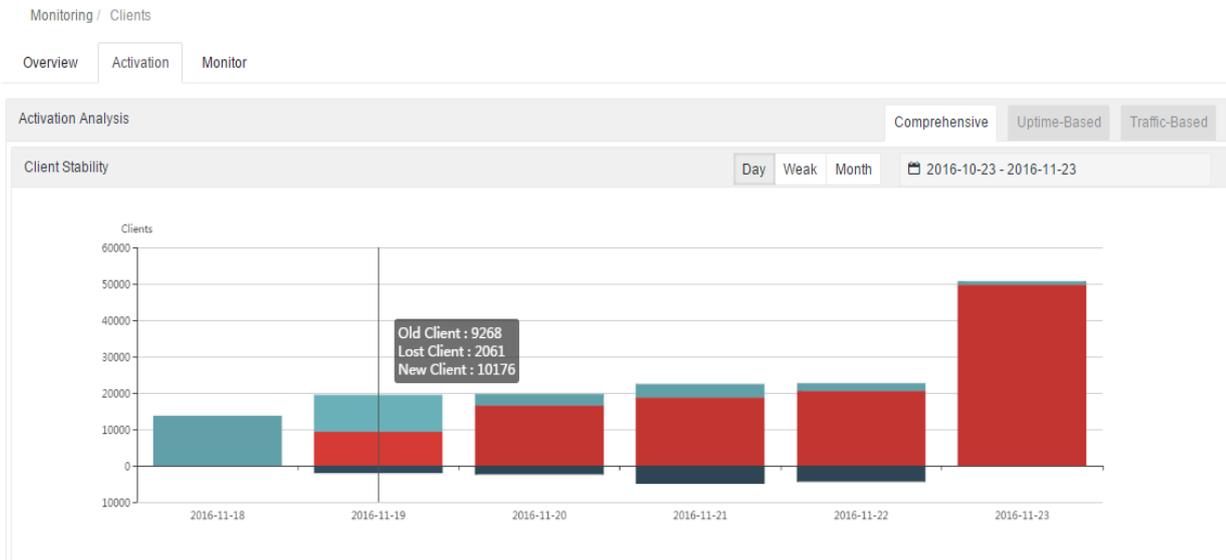
	process. The roaming problem is analyzed based on the roaming stickiness distribution and percentage of each type of clients confronted by roaming stickiness.
Access	Provides access experience assessment based multiple dimensions such as the access failure percentage, abnormal network dropout percentage, access time consumption, and access stability. You can find out the improvement points of network access experience by analyzing the causes (such as the client limitation, RSSI, remote association, and equipment instability) for access failure and abnormal network dropout.
Authentication	Provides analysis and comparison on the success rates and efficiency of different authentication manners, so as to recommend the most stable authentication manner to users. You can also track the authentication data of a single client, to rapidly workout the authentication improvement method.

➤ **Expert Analysis:** allows you to customize the area, time, indicator, parameter, and so on for data filtering.

Clients



- **Overview:** Displays the online client quantity of the entire network (including 2.4G/5G clients), Rx/Tx traffic trend, accumulated Rx/Tx traffic, as well as client and traffic distribution of each area, which enables you to learn about the peak hours and dense areas.



- **Activation:** Displays client stability, retention rate analysis, and three sub tabs: **Comprehensive**, **Uptime-Based**, and **Traffic-Based**. The **Activation** tab helps you obtain data about the client group change and the dependency on the network.

Monitoring / Clients

Overview Activation Monitor

Monitor

Keyword: RSSI<: Time: 2016-11-23 16:02:13

Tx Rate(Mbps)<: Rx Rate(Mbps) Pkt Loss Rate>: Delay>:

<

Show 10 entries Search:

Client MAC	AP Name	Tx RSSI	Rx Rate	Delay(ms)	Pkt Loss Rate(%)	Traffic	Radio(GHz)	SSID	IP	Username	Client Type	Vendor	Association mode	Authentication mode	Time	Remark
No data available in table																

- **Monitor:** Displays details about all online clients by default. The details are updated once every five minutes. You can specify the MAC address, time (for displaying the history), and network parameters for filtering. Click a client to display client details. You can track client traces, including the comprehensive experience scores, historical score trend, online/offline history, roaming trace, and so on.

Devices

Monitoring / Devices

Overview

Overall Monitor

Real-Time Monitor

AC

Show 10 entries

Search:

Name	MAC	Clients	Firmware Version	Hardware Version	Model	Action
M18000	1414.4b81.b498		AC_RGOS 11.1(5)B80P2, Release(03191119)	1.02	M18000	Details
M18000	1414.4b81.b49a		AC_RGOS 11.1(5)B80P2, Release(03191119)	1.02	M18000	Details
M18000	1414.4b81.b49e		AC_RGOS 11.1(5)B80P2, Release(03191119)	1.02	M18000	Details
M18000	1414.4b81.b49c		AC_RGOS 11.1(5)B80P2, Release(03191119)	1.02	M18000	Details

Showing 0 to 0 of 0 entries

First Previous Next Last

Firmware Version List

Show 10 entries

Search:

AP Model	FirmwareVersion	AP Model	Build Date	AP Count
AP120-W	AP_RGOS 11.1(5)B83P2, Release(03192811)	73%	2016-07-28	5887
AP130-W	AP_RGOS 11.1(5)B83P2, Release(03190821)	10%	2016-07-08	810
AP320-I	AP_RGOS 11.1(5)B81P2, Release(03192811)	10%	2016-07-28	767
AP3220-P	AP_RGOS 11.1(5)B81P2, Release(03192811)	5%	2016-07-28	430
AP520-I	AP_RGOS 11.1(5)B81P2, Release(03192810)	1%	2016-07-28	94
AP630(IDA)	AP_RGOS 11.1(5)B82P2, Release(03192815)	1%	2016-07-28	43
RG-AP630(CD)	AP_RGOS 11.1(5)B8, Release(03151006)	0%	2016-03-10	5
AP630(IDA)	AP_RGOS 11.1(5)B8, Release(03162915)	0%	2016-04-29	2

Showing 1 to 8 of 8 entries

First Previous 1 Next Last

- **Overview:** Displays basic information about the AC and AP, including online/offline statuses, device models, firmware versions, and hardware versions.
- **Overall Monitor:** Monitors devices at the management layer, which enables you to learn about the devices that abnormally drop out of the network, that are powered off, and that generate CPU/MEM/client quantity alarms.
- **Real-Time Monitor:** Displays the running statuses of all online devices by default. The statuses are updated once every five minutes. This tab page shows the number of the clients that access the AP,

the 2.4G/5G client distribution, the Rx/Tx traffic, and the number of clients that successfully access the AP but yield poor experience. You can specify the MAC address and time (for displaying the history) for filtering. Click a device to display details. You can track device traces, including the critical traces (online/offline statuses, alarms) of each device, comprehensive scores of radio services, association trend of clients, experience trend, and so on.

Involved indicators include the total load of an area, air interface rates of all the APs in the area, the average delay and packet loss rate of all clients in the area.

Device information includes the AP/AC quantity, models, versions, and the band distribution, vendor distribution, OS distribution, and SSID distribution of currently online clients.

3.1.3 Optimization

This section describes how to solve the network problems detailed in section 4.1.2.

Only the project administrator is allowed to perform optimization operations that involve configuration delivery. **Forced scan** will drop clients out of the network twice within ten minutes. Therefore, **you must copy commands to the AC for command execution.**

One-click Optimization

The screenshot shows a 'Health Check' interface. At the top, there is a progress bar with steps: Preliminary Health Check, In-Depth Health Check, Channel Optimization(Optional), Power Optimization(Optional), Roaming Stickiness(Optional), Remote Association(Optional), Push Commands, and Finish. Below the progress bar, a dark grey box contains a warning: 'The network may be at risk, and network optimization is recommended.' with a 'Health Check' button. Below this, a message says 'If you have changed any group on the device within the past one hour, please click Change Group and take a health check after 5 minutes' with a 'Sync Group' button. At the bottom, a 'Report' table is displayed.

Item	Status	Fault	KPI
Coverage	Bad	74AP(s) with partial coverage	Uplink RSSI
Experience	Good	3% of clients get poor service	Poor Service Rate
Channel Plan	Average	16% of channels are not configured	Global Settings for Radio
Power Plan	Good	2% of powers are not configured	100% Power Rate
Network Saturation	Bad	4AP group(s) with too high network saturation	Channel Usage
Optimization(Under Development)			

In WIS1.0, optimization focuses on improving the accuracy of background algorithms, and ignores the presentation of the optimization function on the front-end operation GUI. As a result, users are unclear about how to properly utilize the optimization function. In WIS2.0, Ruijie adds the optimization function that integrates diversified optimization policies. In this way, you can carry out optimization via a one-click button.

➤ **Procedure for one-click optimization:**

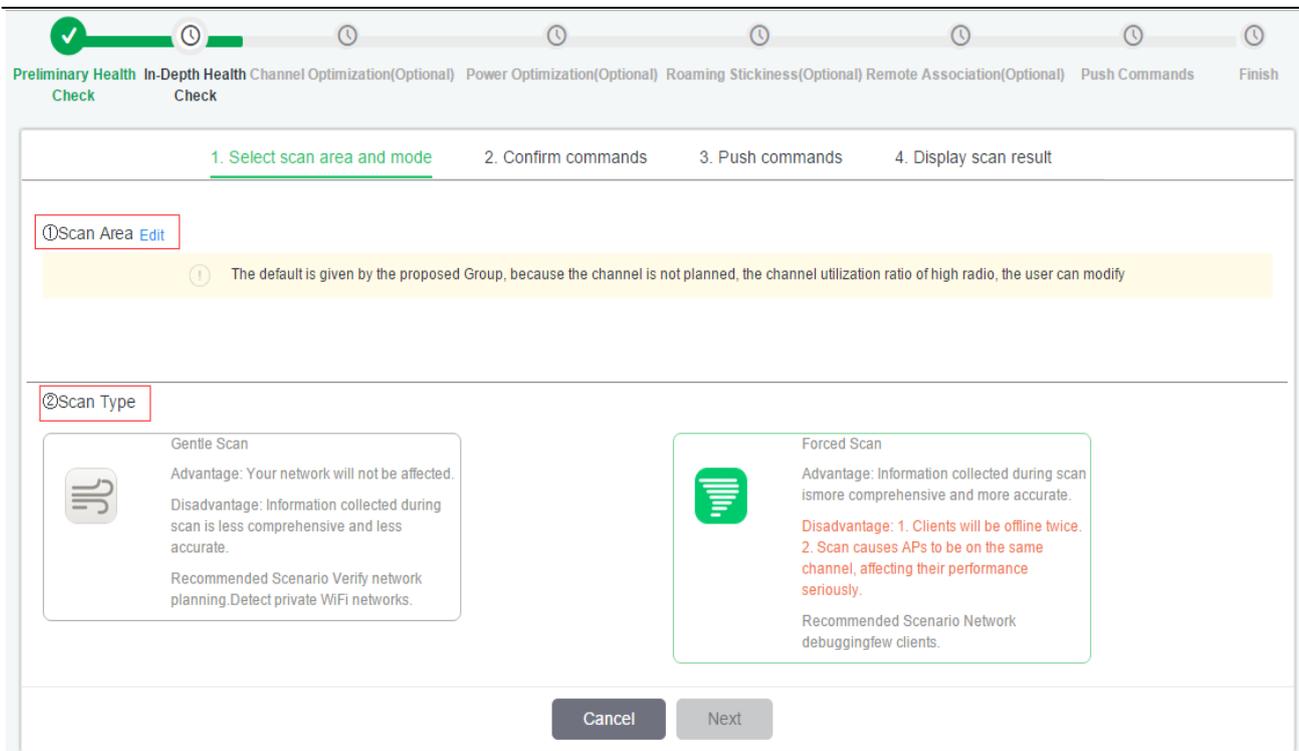
Preliminary Health Check -> In-Depth Health Check -> Channel Optimization -> Power Optimization -> Roaming Stickiness -> Remote Association -> Push Commands -> Finish

➤ **Preliminary Health Check**

Based on the currently collected user experience data, AP data, and device configuration, WIS determines the entire network is risky and prepares a preliminary assessment report. The report includes aspects such as coverage, experience, channel planning, power planning, and network saturation.

Note: For the network for which the channel power has never been configured, it is recommended to choose **Optimization > Config Planning** to carry out basic configuration before monitoring.

➤ **In-Depth Health Check**



After the in-depth health check is completed, WIS works out an ultimate optimization solution. Before in-depth health check is enabled, choose the area (in unit of group) and a scan mode. There are two scan modes: gentle scan and forced scan. You can select a scan mode based on the following table.

Scan Mode	Advantage	Disadvantage	Scenario	Required Duration
Gentle scan	It can be carried out in peak hours. Users are imperceptible to the scan and the network will not be affected. Data of private Wi-Fi signals can be collected.	The information collected is less comprehensive and less accurate.	It is applicable to scenarios for determining whether planning at the early stage is proper, and scenarios for identifying impact of private Wi-Fi signals on the network.	It takes 40 minutes, including scan, data collection, and computing.
Forced scan	The information collected is more comprehensive and more accurate.	Clients are dropped out of the network twice after the forced scan is enabled. The entire performance deteriorates seriously during scan (for ten minutes).	It is mandatory for accurate optimization. It is recommended for scenarios in which few clients are online. Commands must be manually copied to the AC for delivery.	It takes 40 minutes, including scan, data collection, and computing.

For better optimization, both the gentle scan and forced scan are required. The difference between their application scenarios lies in the number of online clients.

After the scan is completed, check data integrity. For groups with the data loss rate exceeding 10%, it is recommended to perform the scan again. If the data loss rate is less than 10%, proceed to the next step. WIS automatically combines the data collected from multiple scans in the background.

Note: WIS2.0 supports manual and automatic delivery of optimization commands except the forced scan commands. For manual delivery, you need to copy configuration of the AC and enter the configuration into the command line. For automatic delivery, configuration can be delivered via the one-click button. The results of automatic delivery are automatically fed back. In active/standby mode of the AC, deliver the scan commands on the active AC only and deliver the optimization commands on both the active and standby ACs. For virtual ACs, deliver both the scan and optimization commands to the active and standby ACs.

➤ **Channel Optimization (optional; recommended by default)**

Based on the collected scan data, WIS calculates channel optimization solutions that are applicable to various scenarios in the background. To ensure accuracy of the channel optimization solution, you need to manually select the scenario of each group. In the later versions, WIS can automatically identify scenarios and recommend the optimal solution.

1. Currently, WIS provides channel optimization solutions to the following four scenarios:

1. Conference hall with high user density/open office scenarios
2. Dorms in colleges and universities (indoor)
3. Scenarios with severe interference from private Wi-Fi signals
4. Routine deployment scenarios

➤ **Power Optimization (optional)**

Power directly affects channel interference scanning results. It is recommended to adjust power based on the field test results prior to one-click optimization.

You can choose this step if the preliminary power planning has not been carried out. Power optimization can achieve significant effect on the network without power planning, and it is not recommended to the network that has the power adjusted. After the power is adjusted, it is recommended to perform the in-depth health check again to ensure proper channel planning.

➤ **Roaming Stickiness (optional)**

If roaming stickiness exists, enable this function. Roaming stickiness is relevant to the NIC capability of clients. In general, iPhone is better than Redmi and other clients of the same level in terms of performance. When this function is enabled, WIS continuously monitors performance of each client in the background and automatically guides the client to access a proper AP. This function can be enabled or disabled based on groups.

Note: This function can achieve best effects only when power planning is proper. However, the client will drop out of the network when it is guided to access a proper AP.

➤ **Remote Association (optional)**

Remote association is caused by improper power configuration of AP management packets. As a result, clients choose a farther AP for access, causing a great difference between the uplink and downlink rates and poor user experience.

After this function is enabled, WIS continuously monitors and optimizes client access in the background, to ensure that only one AP provides strong signals within the coverage.

This function enables continuous convergence until the occurrence possibility of remote association is less than 10%. This function can be enabled or disabled based on groups.

➤ **Push Commands**

Commands can be delivered automatically and manually. In automatic delivery mode, commands are delivered through the encrypted channel between WIS and the device, and the device returns the configuration results (**verification is supported only in B8P3 and B9P2 and later versions**). The commands take effect within ten minutes. In manual delivery mode, you need to copy configuration to the device.

Note: Configuration of each AC needs be copied and delivered separately. The delivery time is subject to the actual requirements.

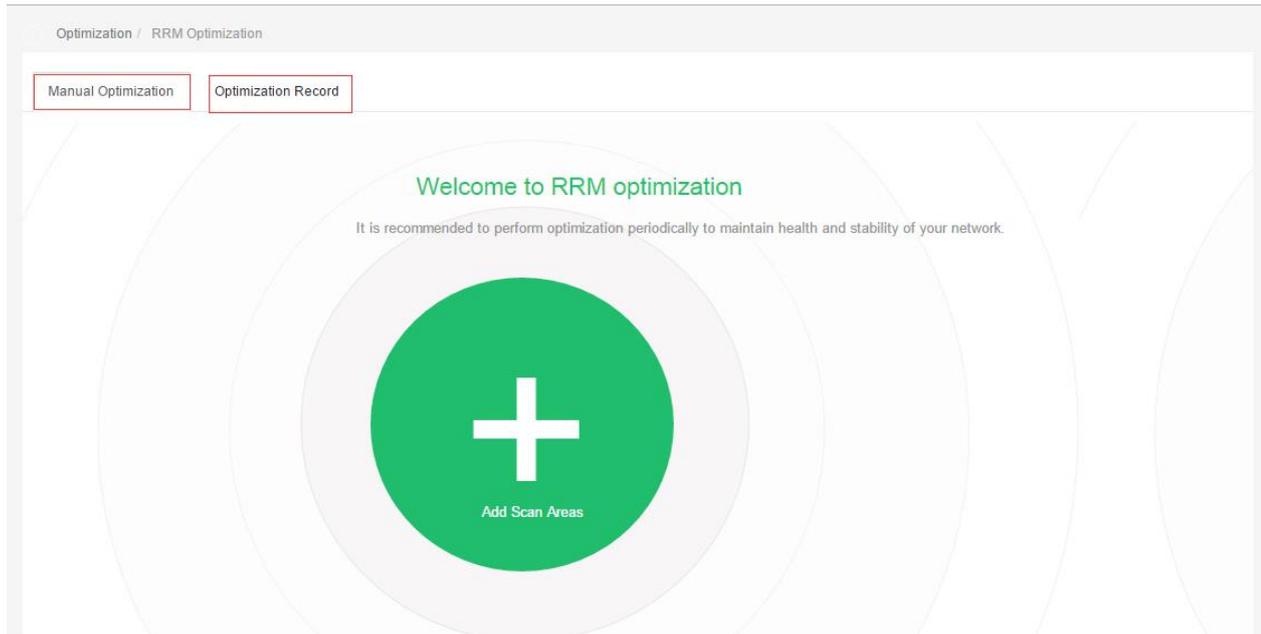
➤ **Finish**

WIS presents optimization effects by displaying basic user experience data before and after the optimization.

Note: You can view optimization operation and configuration in the optimization history. Configuration before the optimization can be restored if necessary.

One-click optimization integrates optimization policies concerning scenario-based channel optimization, power planning, roaming stickiness, remote association, and so on. In some scenarios, only one policy is required or a policy needs to be customized. Therefore, WIS provides an independent switch button for each optimization solution.

RRM Optimization



The **RRM Optimization** page provides manual optimization, scheduled optimization, and optimization record. Manual optimization covers the scan, channel optimization, and power optimization steps of the one-click optimization. Scheduled optimization allows you to specify the scan time and scheme, (for example, enabling forced scan at 2:00 a.m.). Optimization record displays optimization effects and actions. Configuration before a specified optimization action can be restored if necessary.

Intelligent Access

Roaming Stickiness Remote Association 2017-03-14

Problem
When an STA crosses the coverage area, it does not roam into the new coverage area. Instead, it stays associated with the AP in the old coverage area.

Solution

1. Determine the coverage area property
2. Optimize STAs

Monitor

Roaming Stickiness Remote Association 2017-03-14

Problem
An STA is associated with a remote AP instead of a closer AP.

Solution
Change the transmit power of the management packets on the AP to make sure that there is only one signal source within the coverage area.

Monitor

WIS provides intelligent access for the roaming stickiness and remote association functions. Intelligent access can be enabled by group. After a group is monitored for a period of time, consider whether to

enable optimization. If roaming stickiness is serious, enable optimization. The following shows examples of roaming stickiness monitoring and optimization.

Config Planning

The **Config Planning** page provides **Power Plan**, **Config Check**, and **Scheduled Change** functions, as shown in the following figure:

The screenshot displays the 'Config Planning' page with three tabs: 'Power Plan', 'Config Check', and 'Scheduled Change'. The 'Power Plan' tab is active. The interface shows a table of AP configurations with columns for AC Mac, AP Group, Unconfigured Power Rate, Unconfigured 2.4G Power Rate, and Unconfigured 5G Power Rate. Below the table are navigation controls and a 'Configuration Item' section with four panels: Power, Beacon, ResponseRssi, and Mcell. The 'Power' panel shows settings for 2.4G and 5G power and coverage. The 'Beacon' panel shows settings for 2.4G and 5G beacon intervals. The 'ResponseRssi' panel shows settings for 2.4G and 5G response RSSI. The 'Mcell' panel shows options to disable 2.4G and 5G. At the bottom, there are 'Build Config' and 'Push Config' buttons.

AC Mac	AP Group	Unconfigured Power Rate	Unconfigured 2.4G Power Rate	Unconfigured 5G Power Rate	Action
	XSS-2#WLY				Change All Powers
	XSS-17#WYY	0.17%	7.3%	3.74%	Change All Powers
	XSS-16#WYY				Change All Powers
	XSS-1#3#WLY				Change All Powers
	BG-XDWLZX				Change All Powers

Showing 1 to 5 of 8 entries

Configuration Item

- Power** (dbm)
 - 2.4GPow: 17 dbm
 - 5GPow: 25 dbm
 - 2.4GCov: 12 dbm
 - 5GCov: 19 dbm
- Beacon**
 - 2.4G: 100 ms
 - 5G: 100 ms
- ResponseRssi**
 - 2.4G: 20 dbm
 - 5G: 20 dbm
- Mcell**
 - Disable 2.4G
 - Disable 5G

Build Config **Push Config**

➤ Power Plan

The one-click optimization function includes power optimization. Power optimization is recommended only when the system discovers that power of many areas is set to the default value. Configuration items of power optimization include **Power Local**, **Beacon**, **ResponseRssi** and **Mcell**.

Notes:

1. If the power on site has been properly adjusted, do not use the one-click optimization function.
2. Currently, power optimization involves a group of default parameters, which are suitable for wall APs in dorms, indoor APs in offices, and APs with even client distribution nearby. These default parameters are unsuitable and are not recommended for outdoor APs and APs that are deployed in corridors to cover rooms on two sides.

Mcell is a small cell solution, and is enabled in cases with dense clients. In general, contact the WIS team to assess whether it can be enabled.

➤ Config Check

Power Plan | Config Check | Scheduled Change

< Today > 风险项预览 Total Changes:0

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
30	31	1	2	3	4	
6	7	8	9	10	11	
13	14	15	16	17	18	
20	21	22	23	24	25	
27	28	29	30	1	2	
4	5	6	7	8	9	

检查项	风险等级	配置命令	规则描述	问题建议
No data available in table				

Showing 0 to 0 of 0 entries

First Previous Next Last

配置检查规则

检查项	风险等级	配置命令	规则描述	问题建议
No data available in table				

Showing 0 to 0 of 0 entries

First Previous Next Last

The configuration check rules are maintained by the WIS operation center. WIS checks all risky configuration items and continuously updates the configuration check rules. The Config Check page provides the check history, detailed description of each risky configuration item, and corresponding suggestions.

➤ Scheduled Change

Optimization / Config Planning

Power Plan | Config Check | Scheduled Change

< Today > Preview Total Changes:0

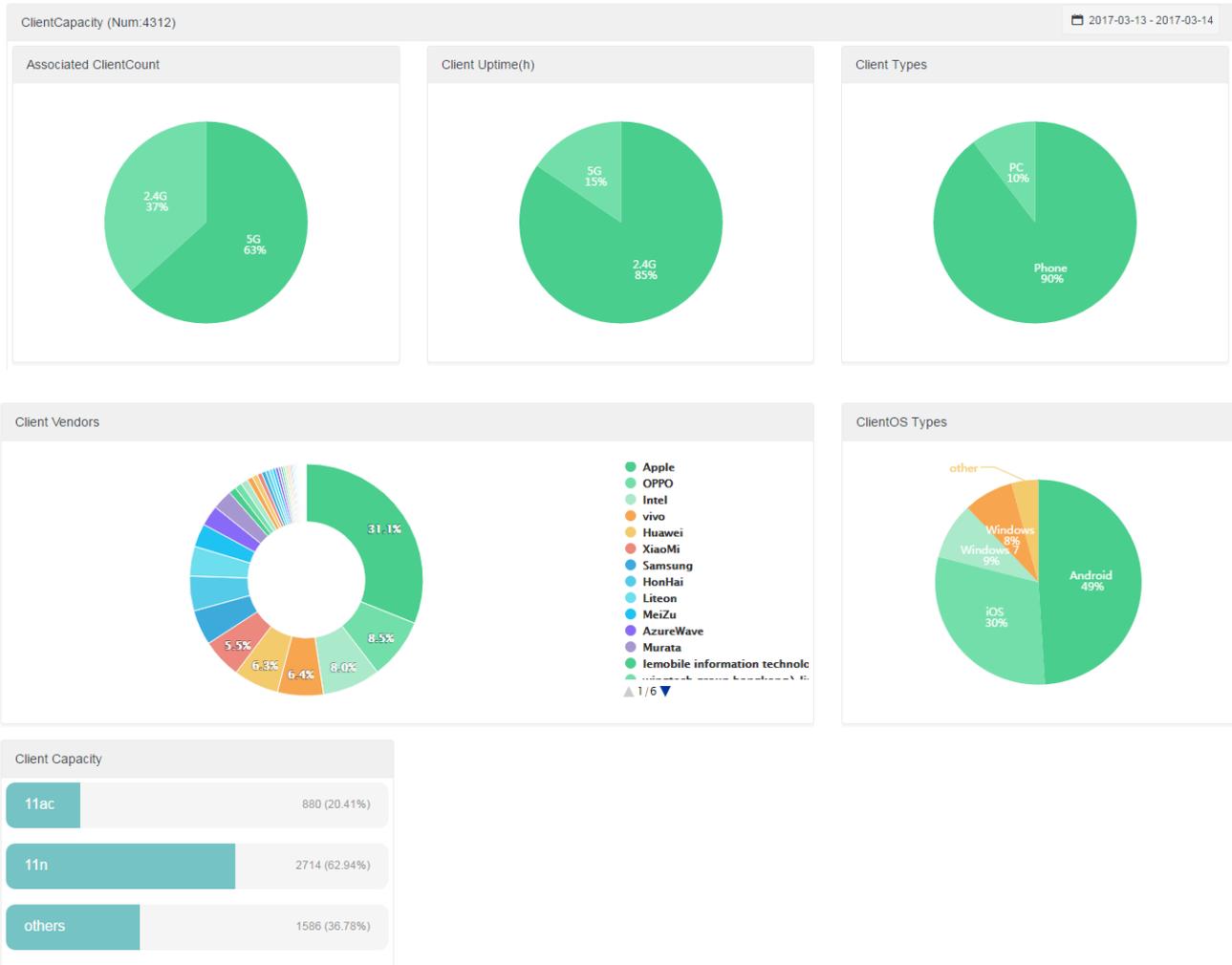
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
30	31	1	2	3	4	
6	7	8	9	10	11	
13	14	15	16	17	18	
20	21	22	23	24	25	
27	28	29	30	1	2	
4	5	6	7	8	9	

AC:()	^
No Change	
AC:()	^
No Change	
AC:()	^
No Change	
AC:()	^
No Change	

This function allows you to track history and display details of each configuration change of the device.

3.1.4 Data Analysis

The data analysis module is extensible based on user requirements. WIS2.0 only provides the client capacity analysis.



3.2 Optimization Problems and Solutions

Channel Interference

Problem description: If channels are not properly planned, it is very likely that neighbor APs use the same channel. This increases co-channel interference and deteriorates wireless transmission quality. Proper channel optimization can effectively reduce conflicts and improve wireless transmission, and in extreme cases, can increase the throughput by 15 times, achieving rapid and smooth network access. Channel optimization provides network-wide scan, and calculates the optimal channel planning to minimize interference.

Solution: Enable the scan mode to scan co-channel interference from neighbor APs and calculate the optimal channel allocation solution.

Note: There are two scan modes: forced scan and gentle scan. Both of them take ten minutes. In forced scan mode, clients will be dropped out of the network twice during the scan. In gentle scan mode, clients will not be dropped out of the network. However, the collected data may be less comprehensive. This mode can be enabled in peak hours to determine the general interference status, which may cause delay perceptible to users for services such as games.

Power Optimization

Problem description: Wireless devices involve two types of power: local power and beacon power. Local power is the Tx power of the AP antenna. Beacon power is the power used by the AP to transmit beacon and probe response packets. If the beacon power is not configured, both beacon and probe response packets are transmitted by using the local power. If the beacon power is configured, both beacon and probe response packets are transmitted by using the beacon power. Beacon power is usually used to reduce AP coverage. Simply speaking, excessively high local power will increase interference, while excessively low local power will reduce the AP downlink rate and affect AP throughput and user experience. On the other hand, excessively high beacon power will result in overlarge AP coverage, thereby causing remote access and frequent roaming and deteriorating user experience, while excessively low beacon power will result in insufficient coverage.

Solution:

- a. **Initial power:** The default power of Ruijie APs is 100% without beacon power. Field tests show that, for indoor settled APs, indoor wall APs with even coverage (for example, coverage of APs deployed in corridors for rooms on both sides is uneven), the initial power benchmarks for balance between coverage and rates are 17 dB for the 2.4 GHz frequency band, 25 dB for the 5 GHz frequency band, and 12dB for 2.4G beacon packets.

The 5 GHz attenuation is higher than 2.4 GHz attenuation. Therefore, the 5 GHz initial power is higher than the 2.4 GHz initial power so that clients choose the 5 GHz frequency band for access.
- b. **Long-term fine adjustment 1:** After remote association is identified, WIS tries to adjust the beacon power to a proper value by a step of 1 dB. This type of adjustment requires long-term collection of network access statuses for automatic convergence.
- c. **Long-term fine adjustment 2:** WIS detects the signal strength and uplink and downlink rates of the associated AP. Based on the relation between the rates and signal strength, WIS determines whether the local power of the AP is proper, and then implements long-term fine adjustment.

Dense Deployment

Problem description: In environments with dense APs, if AP power is excessively low, the downlink rate of data packets is small; and if AP power is excessively high, interference to low-speed packets such as management frames increases between APs due to the low speed and wide coverage characteristics of management frames. In addition, air interface utilization decreases and remote association as well as roaming stickiness occur.

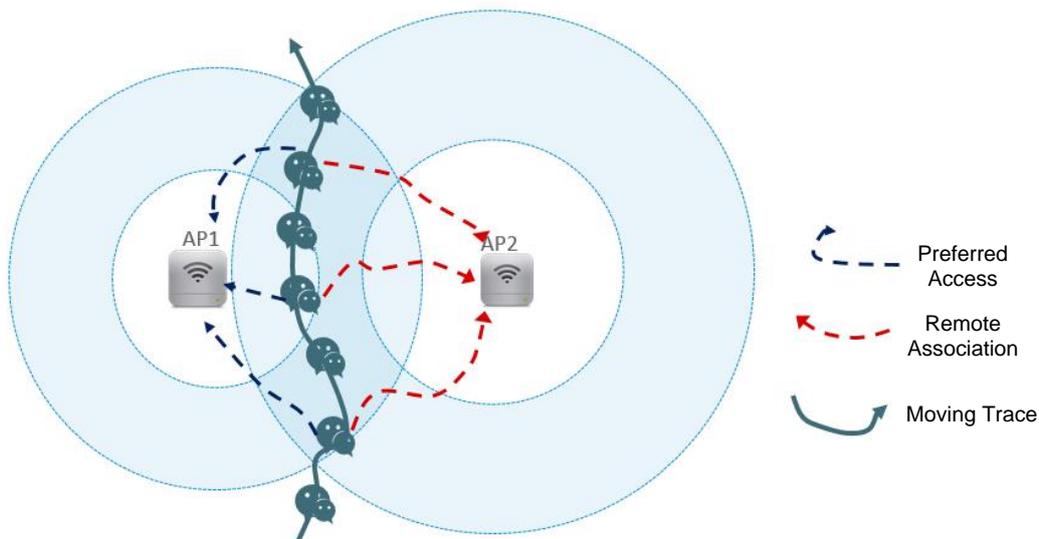
Solution: Adopt the Mcell function and configure different power values for the APs. Use configuration commands to reduce AP coverage, thereby decreasing interference between APs and improving performance of the entire wireless network. This solution is mainly used for the 2.4 GHz optimization because 5 GHz signal attenuation is high and interference is low.

Applicable scenarios:

1. APs are dense, RSSI values of clients are high (above 35 dB), and remote association and interference exist. In this case, you can reduce the AP coverage.
2. Interference between APs is high (background noise ≤ -95 dB). In this case, you can reduce the AP monitoring range.
3. AP120/AP320/AP330/AP520 is deployed.

Remote Association

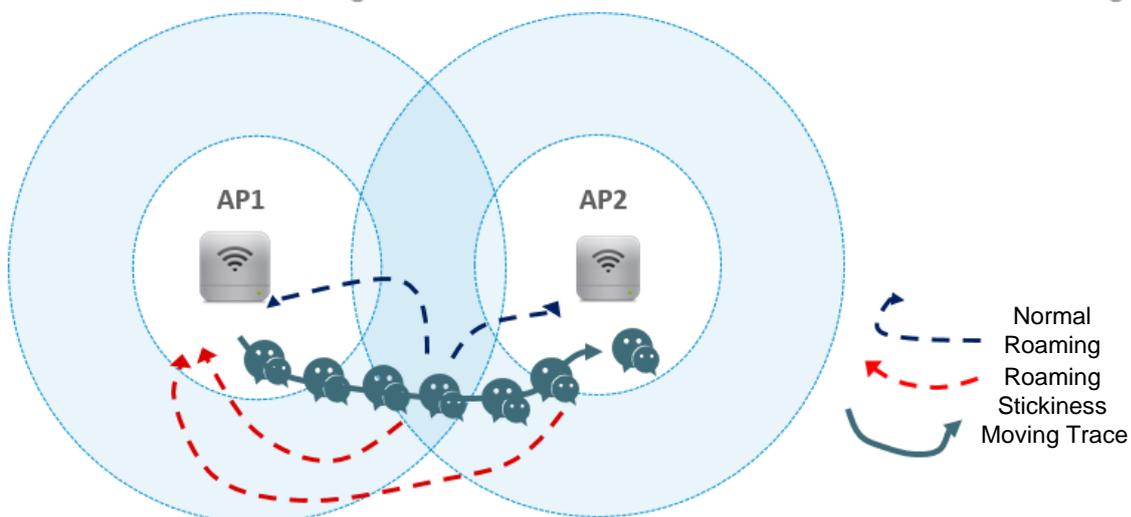
Problem description: The power of AP2 is higher than that of AP1 nearby, and therefore a client regards that signals of AP2 are stronger. In fact, the distance between the client and AP2 is longer. Although downlink signals of AP2 are stronger, uplink signals are weak. Therefore, user experience is poor. The client should access AP1 to achieve balanced uplink and downlink signal strength and good experience. Remote association is a major network problem apart from interference, and affects experience of a wide range of users.



Solution: WIS collects detection information of clients on the entire network to analyze the network status of the client. When WIS identifies severely unbalanced uplink and downlink signal strength and discovers an AP more suitable for access, WIS performs fine power adjustment for long-term optimization and convergence.

Roaming Stickiness

Problem description: In the moving process, a client will handed over from AP1 to AP2 that is at a closer distance. However, some clients may stick to the original AP that is at a longer distance, which is called roaming stickiness. In this case, user experience is bad. To solve this problem, access navigation is provided. Roaming stickiness is similar to remote association in terms of phenomena, but their solutions are different. If remote access occurs on a wide range of clients, WIS regards that remote association occurs and the AP power needs to be adjusted. If certain clients stick to the original AP and do not roam, WIS regards that roaming stickiness occurs, and access navigation is required.



Solution: WIS determines whether clients need to roam according to signal changes of the clients, and determines whether a more appropriate AP exists near the clients based on probe requests. Finally, WIS determines whether to navigate clients based on user experience.

Notes: Currently, there is no groundbreaking method for avoiding intermittent disconnection of terminals caused by access navigation. This intermittent disconnection is imperceptible in general. Compared with the algorithm employed by WIS, the conventional access navigation algorithm cannot identify whether clients are at network edges, and access of these edge clients is limited, resulting in poor experience. Moreover, the conventional access navigation algorithm forcedly uses the RSSI value as the navigation threshold, even in cases where user experience is still good upon stickiness.

3.3 Optimization Suggestions

Comply with the following rules to implement remote and on-site optimization.

1. Obtain basic information about the customer.
Learn about models of major devices, deployment mode (even deployment or corridor deployment for room coverage), and major services.
2. After WIS is accessed, collect data for one or two hours to provide a comprehensive assessment.
Learn about the device scale of the entire network, client scale, rough client distribution, peak hours, and user experience (delay, packet loss rate, speed, and channel usage).
3. Observe traffic in peak hours.
4. Perform the gentle scan to detect the private Wi-Fi signal status, and enable remote association and roaming stickiness monitoring.
5. Perform the forced scan in allowed periods of time to determine the co-channel interference status, and check whether the result of the forced scan is consistent with empirical judgment with reference to the result of the gentle scan.
6. Collect data of a whole day to determine whether to deliver optimization policies.
 - i. Optimization is strongly recommended if channel and power planning are not performed in the network at all or not performed in a large area.
 - ii. Optimization is recommended if channel usage is high and interference is serious.
 - iii. Enable access navigation in the case of remote association and roaming stickiness.
 - iv. If APs are deployed in corridors, do not enable the **Power Optimization** function.

4.4 Command Lines

➤ On the AC (in enable mode)

1. WIS server address configuration

Description	It is used to configure the WIS server address.
Command	wis server http://xxx.xxx.xxx.xxx:port Address for accessing WIS: http://121.43.100.117:88/
Version	Versions later than B8 support this command.

2. WIS switch

Description	It is used to enable/disable WIS.
Command	[no] wis enable
Version	Versions later than B8 support this command.

3. Forced scan

Description	Before the scan, the 2.4 GHz channel is changed to Channel 1, the 5 GHz channel is changed to Channel 149, the beacon transmission period is changed to 50 ms (if available), and the power for sending beacon packets is changed to the local power. Then, enable the air interface scan (AIS) for ten minutes. After the scan is completed, restore the original channels, beacon transmission period, and beacon transmit power.
Command	debug wis scan-neighbor scan-neighbor-now tough-mode [key] [area] <i>key: Specifies the number of scan times. The value increases by one every time the scan data is uploaded to the server.</i> <i>area: Specifies the name of an AP group, or is set to all, to enable the AIS in one group or all groups.</i>
Version	Versions later than B8 are supported.

4. Gentle scan

Description	It is used to enable the AIS for ten minutes without modifying other configuration.
Command	debug wis scan-neighbor scan-neighbor-now gentle-mode [key] [area] <i>key: Specifies the number of scan times. The value increases by one every time the scan data is uploaded to the server.</i>

	<i>area: Specifies the name of an AP group, or is set to all, to enable the AIS in one group or all groups.</i>
Version	Versions later than B8 are supported.

5. Hybrid scan

Description	Before the scan, the 2.4 GHz channel is changed to Channel 1, the 5 GHz channel is changed to Channel 149, the beacon transmission period is changed to 50 ms (if available), and the power for sending beacon packets is changed to the local power. Then, enable the AIS for ten minutes. After the scan is completed, restore the original channels, beacon transmission period, and beacon transmit power.
Command	<p>debug wis scan-neighbor scan-neighbor-now mix-mode [key][area]</p> <p><i>key: Specifies the number of scan times. The value increases by one every time the scan data is uploaded to the server.</i></p> <p><i>area: Specifies the name of an AP group, or is set to all, to enable the AIS in one group or all groups.</i></p>
Version	B8P3, B9P2, and their later versions support this command.

6. Roaming stickiness

Description	It is used to enable roaming stickiness optimization.
Command	debug wis sticky-nav-enable 1 0 [area] <i>area: Specifies the name of an AP group, or is set to all, to enable roaming stickiness optimization in one group or all groups.</i>
Description	It is used to disable roaming stickiness optimization.
Command	debug wis sticky-nav-enable 0 0 [area] <i>area: Specifies the name of an AP group, or is set to all, to disable roaming stickiness optimization in one group or all groups.</i>
Version	B8 and later versions support these commands.

7. Remote association

Description	It is used to enable remote association optimization.
Command	debug wis farpoint-enable 1 0 [area] <i>area: Specifies the name of an AP group, or is set to all, to enable remote association optimization in one group or all groups.</i>
Description	It is used to disable remote association optimization.
Command	debug wis farpoint-enable 0 0 [area] <i>area: Specifies the name of an AP group, or is set to all, to disable remote association optimization in one group or all groups.</i>
Version	B8 and later versions support these commands.

➤ AP

Debugging command

Description	It is used to display RRM2.0 internal parameters.
Command	debug wis scan-neighbor show
Description	It is used to collect statistics about internal data of RRM2.0. Statistical data is available only in the scan period.
Command	debug wis scan-neighbor statistic
Version	B8P3, B9P2, and their later versions support this command.

4. Conclusion

The core function of WIS is experience measurement, diagnosis, forecast, alarm, and intelligent optimization. In the future, WIS focuses on artificial intelligence, network security, and defense. In the long way of improvement, WIS versions will be continuously updated.