
Ruijie WIS π User Manual

V3.5



Ruijie Networks Co., Ltd.

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1. About WIS

WIS is short for Wireless Intelligent Service. It's 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.

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.
- 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

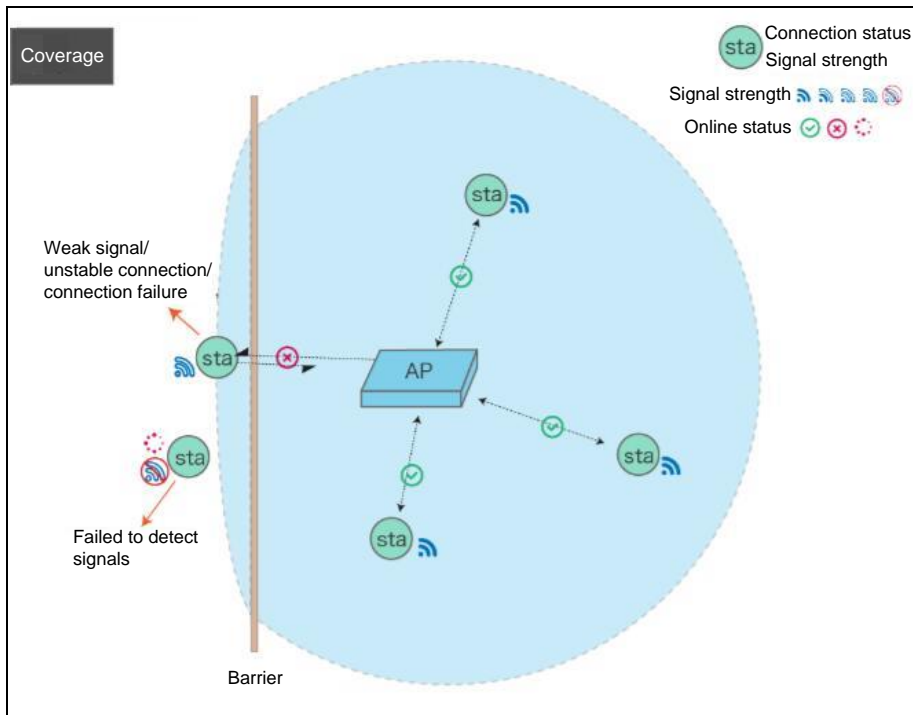
Cloud enables real-time and integral information. Therefore, intelligent algorithms can be applied to improve wireless experience. Wireless access to the cloud network enables more intelligent and automatic optimization. Moreover, interaction via WeChat and Apps are supported.

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

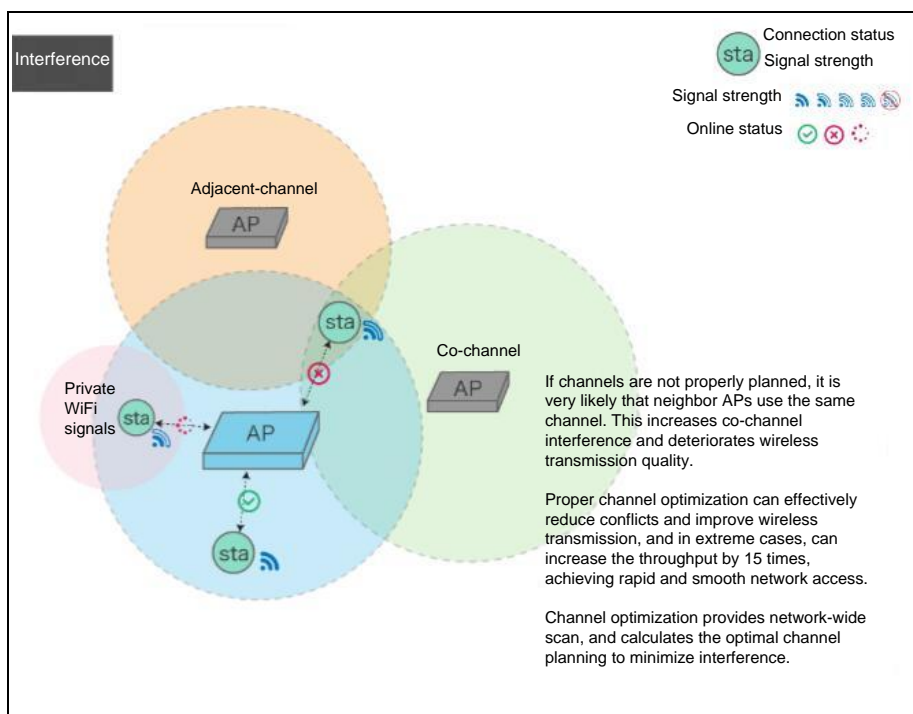
➤ WIS solution to challenges concerning technologies

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

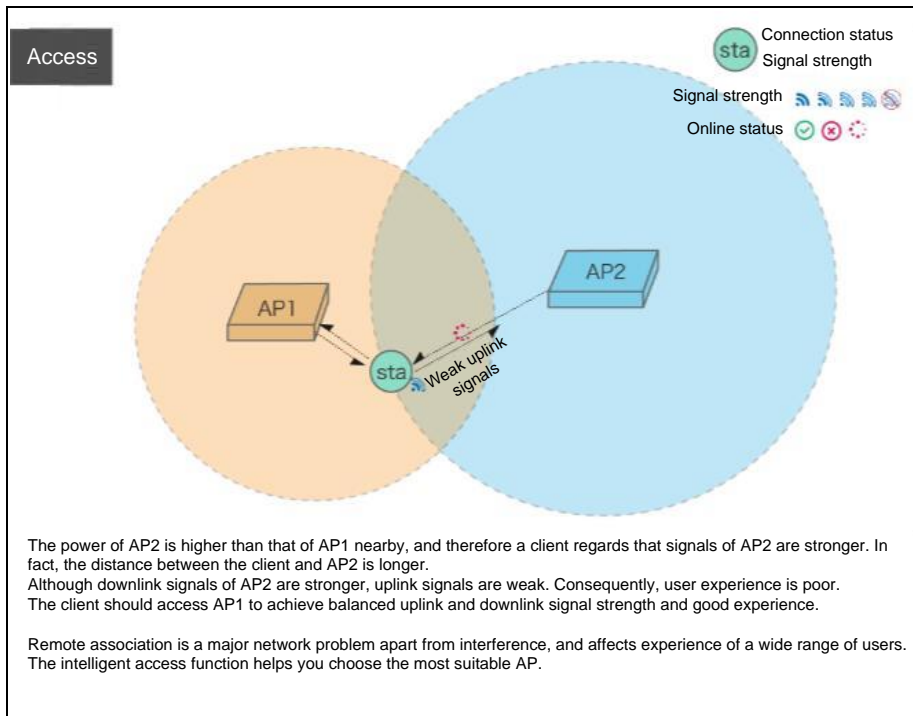
1. Coverage holes are caused by uncertain coverage range of wireless signals.



2. Interference is caused by band sharing.



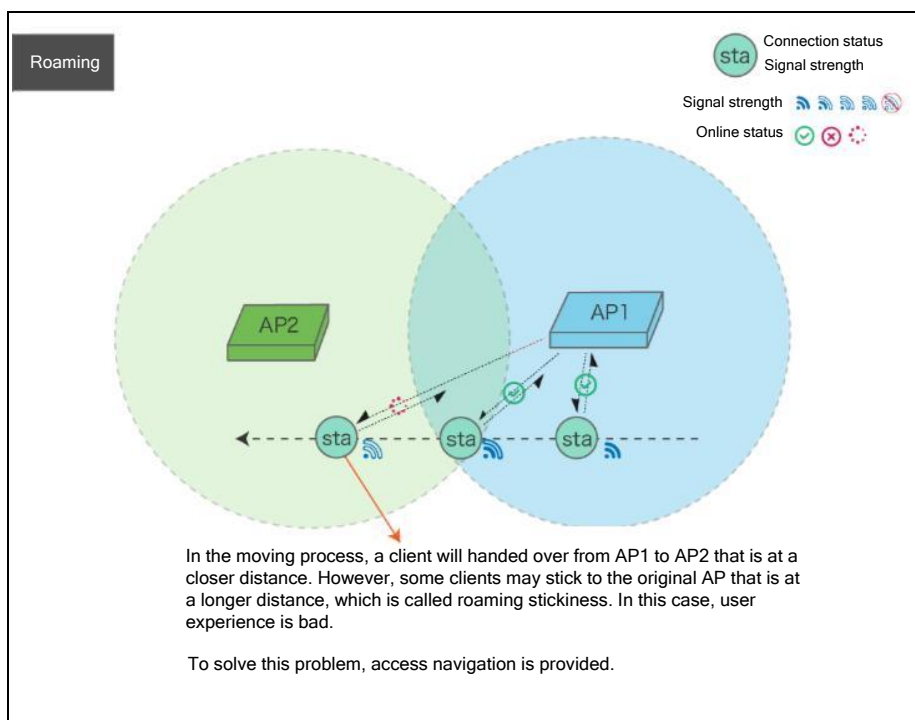
3. Access to an inappropriate AP is caused due to client difference and personalization, as the client can choose the AP to be accessed.



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



5. 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.

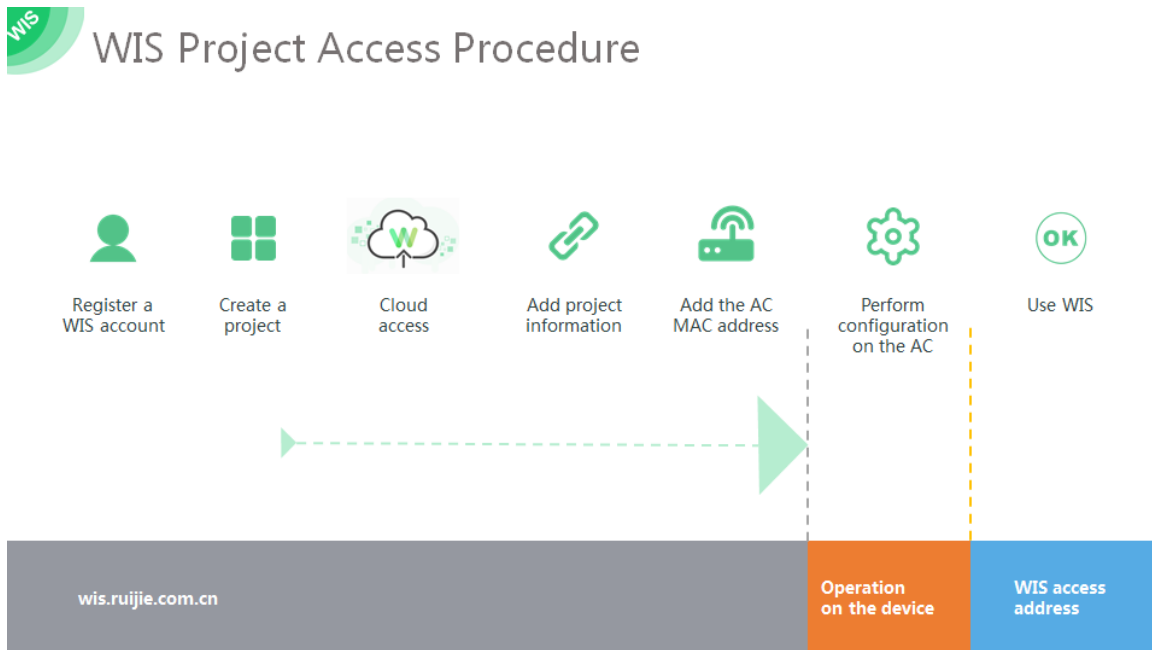
2. WIS Deployment

2.1 WIS Support Status

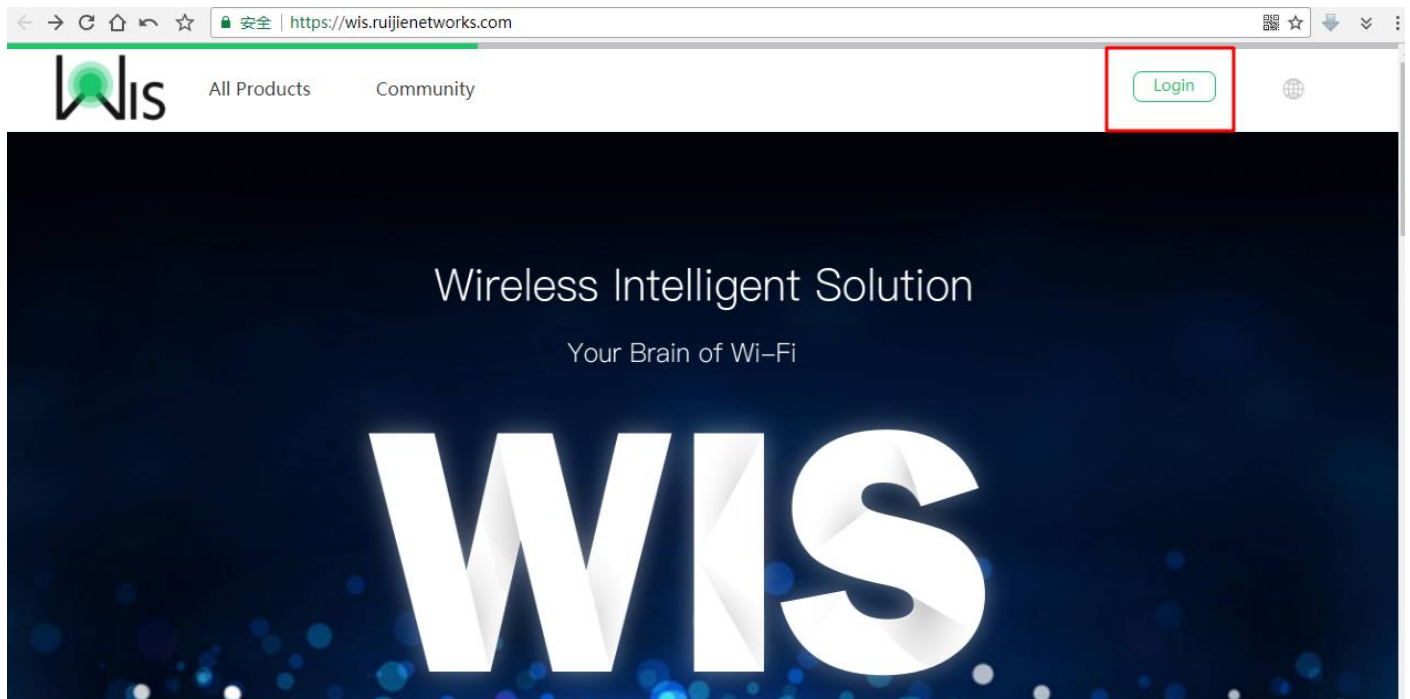
Version (11.X)	Release Status	WIS Support Status
11.1(5)B7 or Later	Official release	The AC's firmware version should be later than B7. Recommend to use the latest official release.

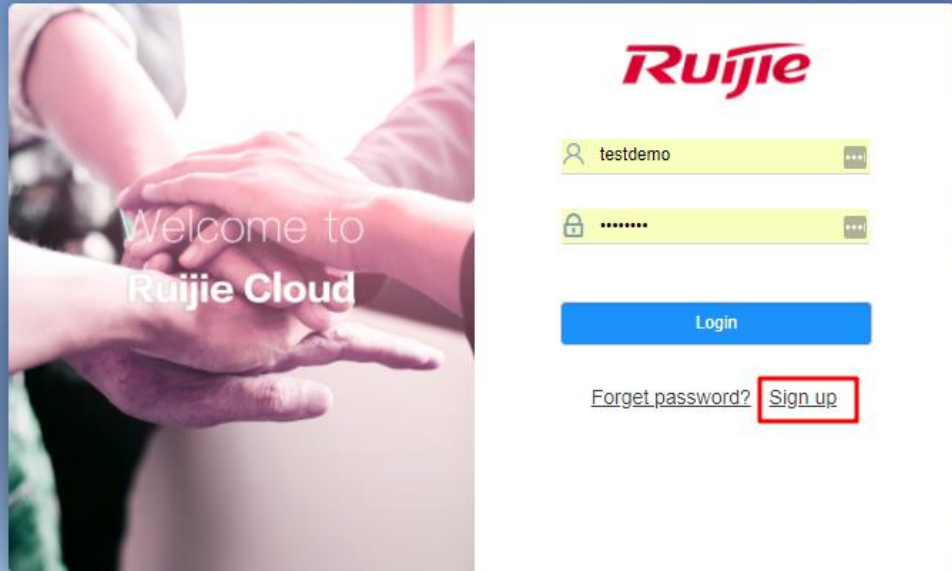
2.2 Access to WIS

The following figure shows the WIS access procedure.



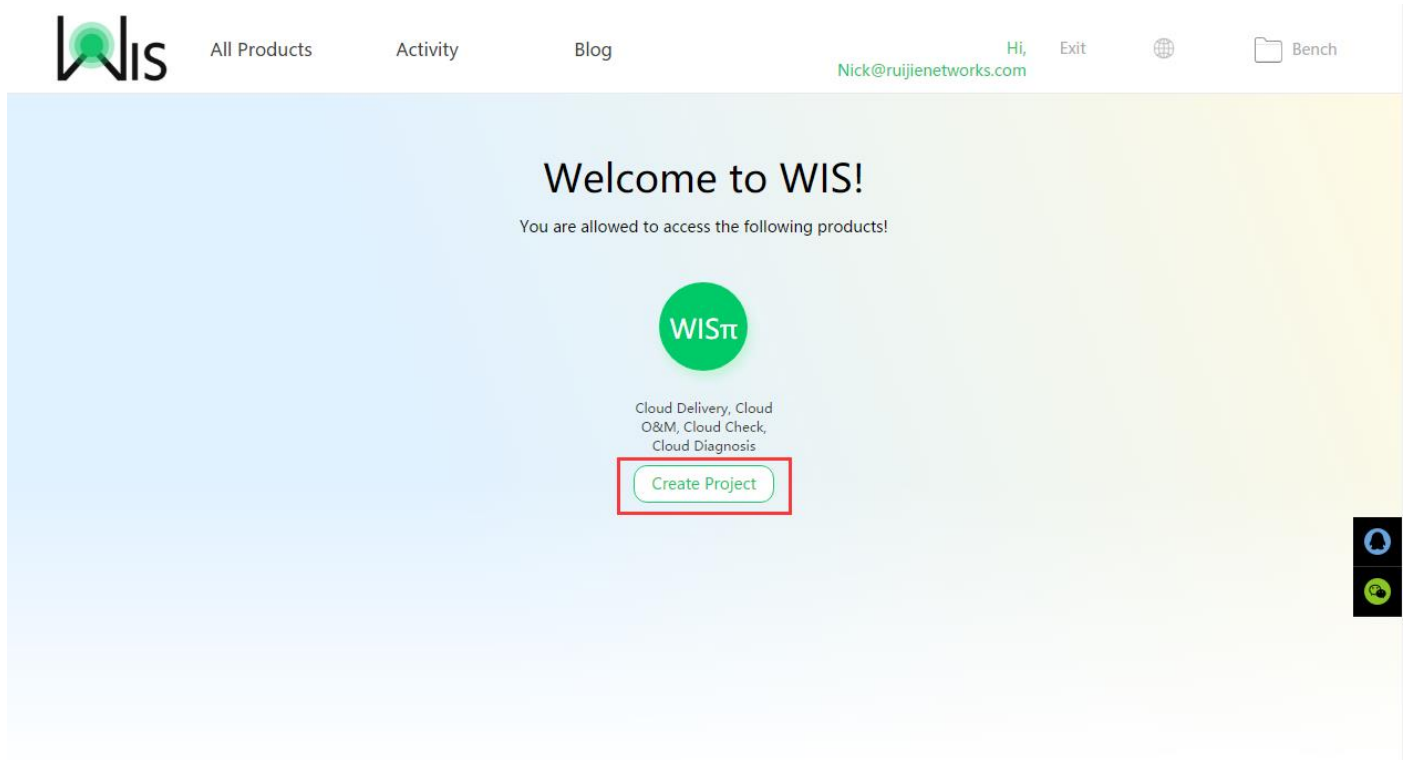
1. Register a WIS account by accessing our official website: [WIS.ruijienetworks.com](https://wis.ruijienetworks.com) (Chrome browser is recommended)





The image shows the login page for Ruijie Cloud. On the left, there is a photograph of several hands stacked together, with the text "Welcome to Ruijie Cloud" overlaid. On the right, the Ruijie logo is at the top. Below it are two input fields: the first contains "testdemo" and the second contains ".....". A blue "Login" button is positioned below the password field. At the bottom, there are two links: "Forget password?" and "Sign up", with the "Sign up" link highlighted by a red box.

2. Create a project:



The image shows the WIS dashboard. At the top left is the WIS logo. The navigation menu includes "All Products", "Activity", and "Blog". On the right, it says "Hi, Nick@ruijienetworks.com" with an "Exit" button and a globe icon. A "Bench" folder icon is also present. The main content area features a "Welcome to WIS!" heading, followed by the text "You are allowed to access the following products!". Below this is a green circular icon with "WISπ" inside. Underneath the icon, the text reads "Cloud Delivery, Cloud O&M, Cloud Check, Cloud Diagnosis". A "Create Project" button is highlighted with a red box. On the far right, there are two small circular icons, one blue and one green.



New Project

Add Project Member

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

Team Member

Nick@rujiene...
Create

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 WISIt 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

Back Example 233

1 — 2 — 3 — 4

Connection Info **Add AC** Connect to WISIt Finish

Information List

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

Add AC

How to get the AC MAC?
AC enablemodel : show ac-config | in Mac

Save

Previous Next

Back Example 233

1 Connection Info 2 Add AC 3 Connect to WISr 4 Finish

+ Add AC

xxxx.xxxx.xxx9 Example 233 delete

Previous Next

Information List

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

5. Copy the following commands to AC:

Back Example 233

1 Connection Info 2 Add AC 3 Connect to WISr 4 Finish

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.rujietworks.com/login?lang=en>, and enter your account to use WISπ.

Back

2.3 Bandwidth Required by WIS

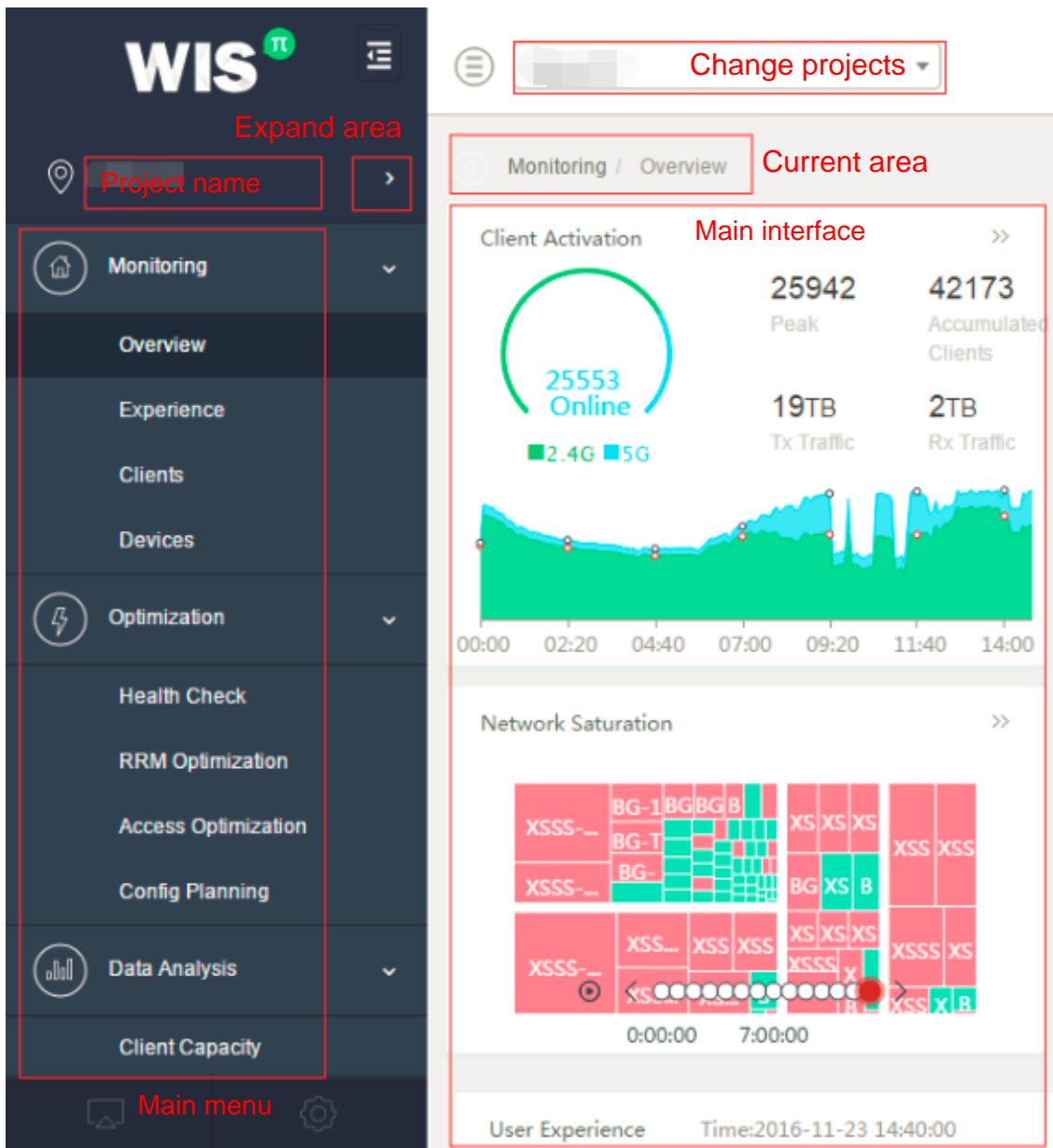
Scale	Peak Data Volume (Within 5 Minutes)	Average Bandwidth in Peak Hours	Weekly Average Bandwidth
5,000 STA AC→Server	7.2 MB	200 kbps	30 kbps
20 STA AP→AC	21 KB	560 bps	100 bps

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



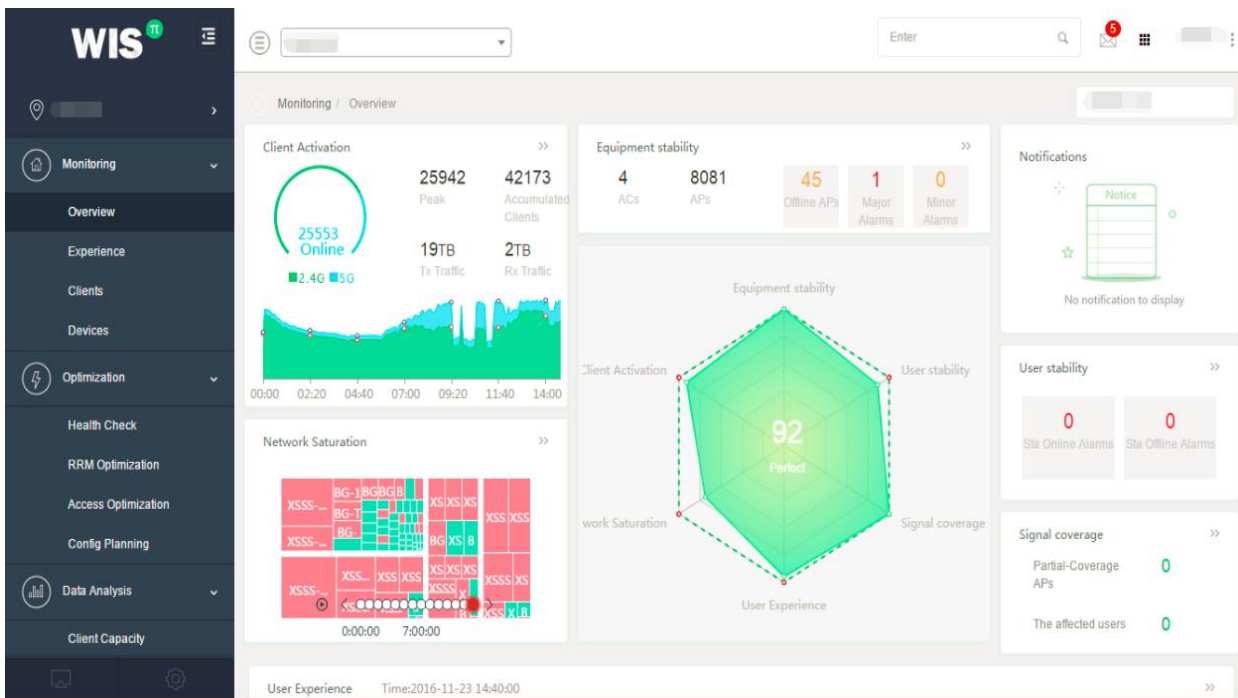
The navigation pane on the left displays the information about the entire network by default. Click the expand area button to specify an area. Areas are automatically classified by the AP group and AP name and can be manually adjusted in the background.

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).

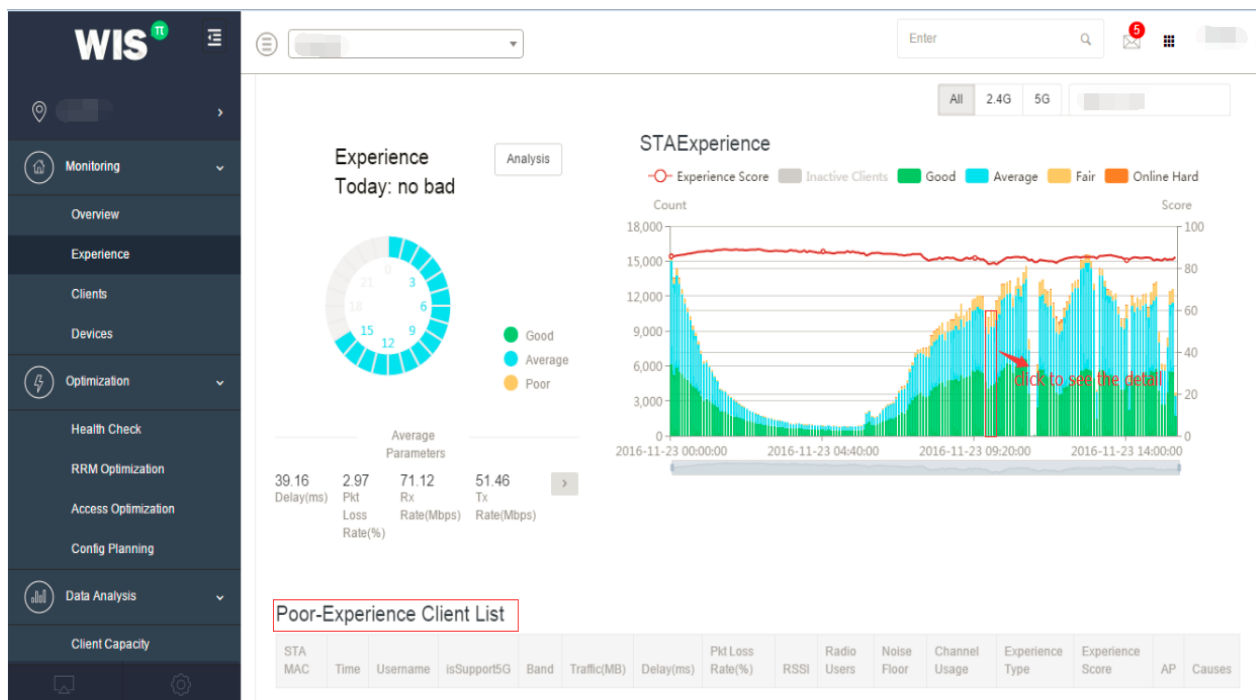
<p>Basic Network Status</p>	<p>Helps you learn about the equipment stability and user stability, so as to determine the stability of wired and wireless lines and whether there are poor coverage areas with high network requirements, thereby providing effective basis for device supplement.</p>
<p>Client 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.

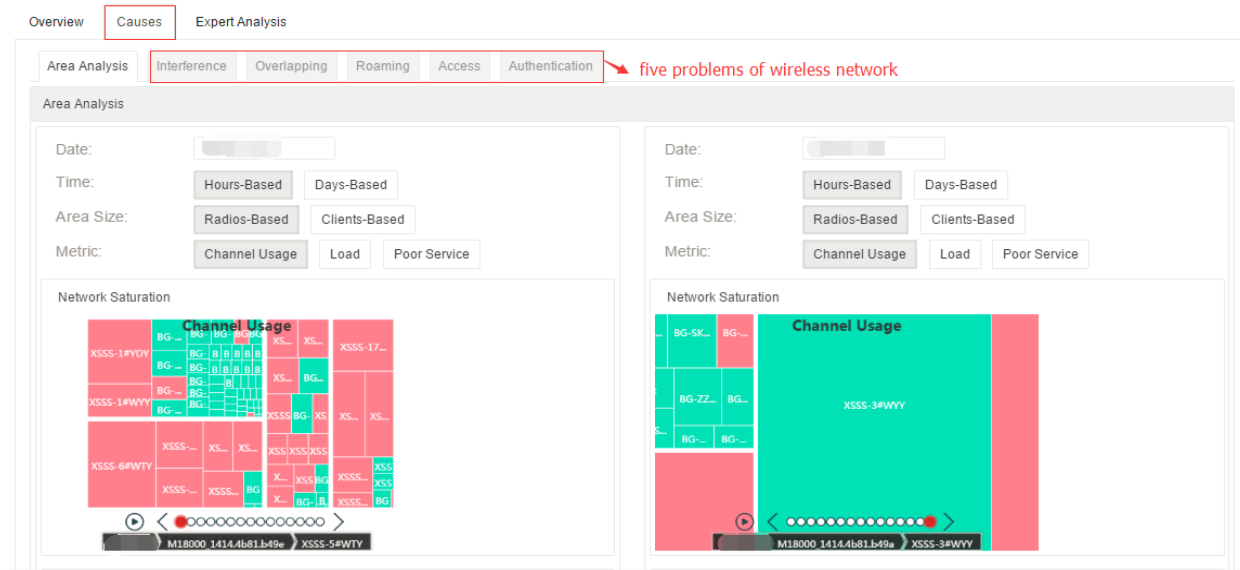
Experience



- **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.



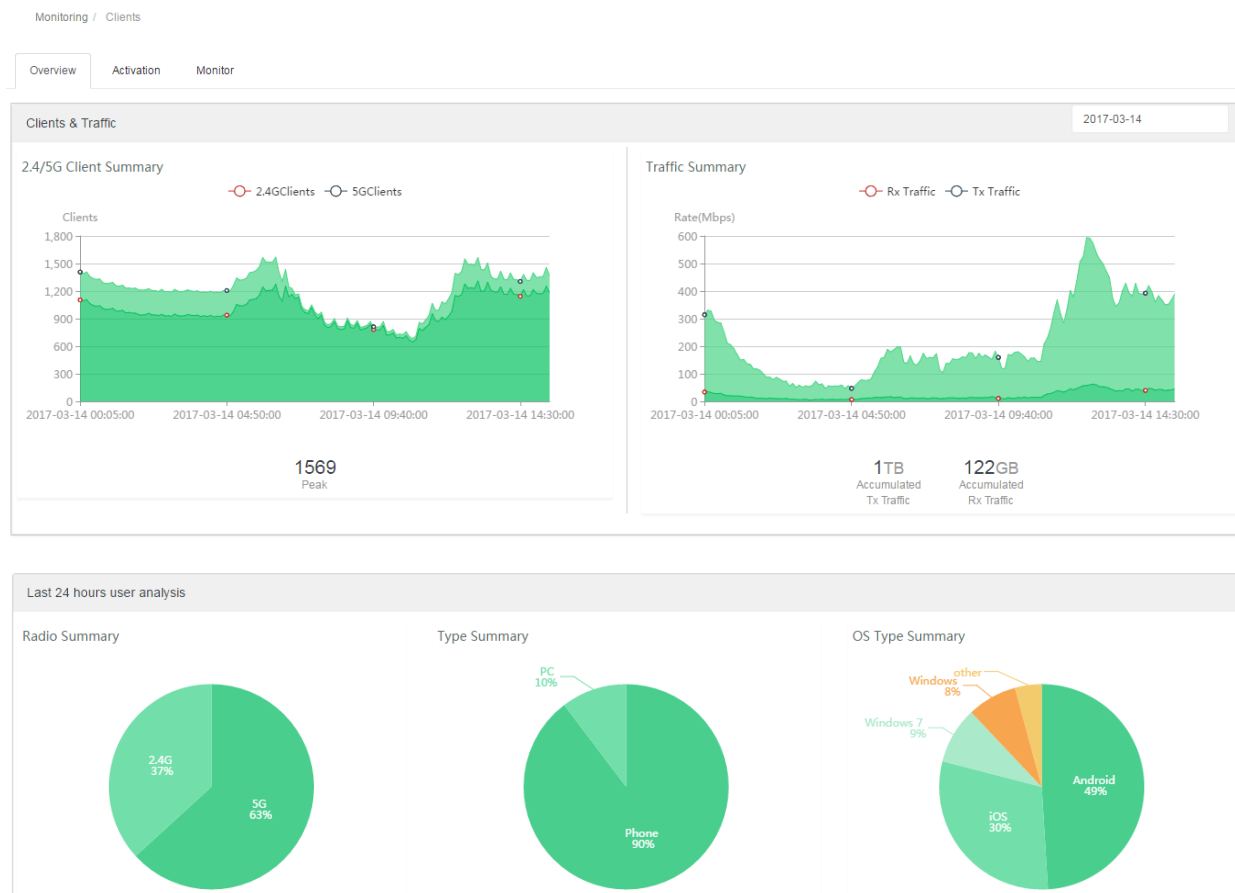
➤ **Causes:** Provides detailed analysis on the five aspects that affect user experience of the wireless network, including interference, coverage, roaming, access, and authentication. The preceding figure shows the signal interference. For other views, refer to WIS GUIs.

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

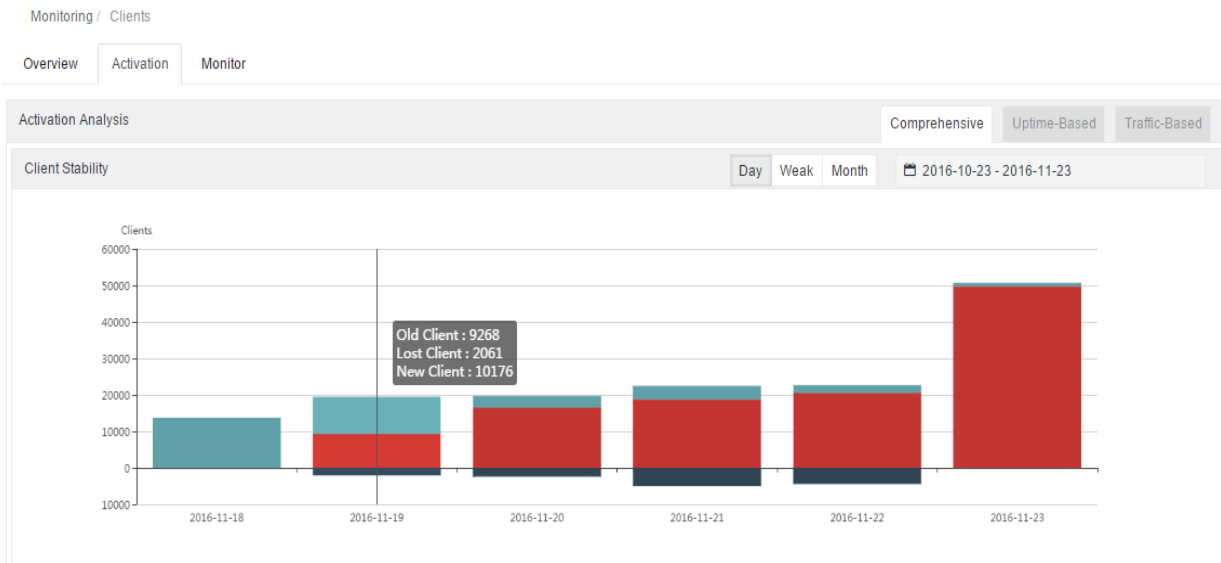
	process. The roaming problem is analyzed based on the roaming stickiness distribution and percentage of each type of clients confronted by roaming stickiness.
Access	Provides access experience assessment based multiple dimensions such as the access failure percentage, abnormal network dropout percentage, 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.

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.**

Health Check

Optimization / Health Check

Health Check Optimization Record

Start Select Scenario Check Push Commands Finish

Optimization

This function allows you to optimize channel and power and solve issues caused by roaming stickiness and remote association. Please start optimization after all APs in the target area go online.

Steps:

- Select the AP group and the scenario.
- Perform optimization.
- Check optimization result.

It takes about 10 minutes to scan and about 40 minutes to optimize the network. It is recommended to avoid peak period.

[Optimize](#) [Sync Group](#)

Last Optimized on:2018-04-27 17:46:13

➤ Procedure for one-click optimization:

Preliminary Health Check ->Select Scenario -> Check -> 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.

➤ Select Scenario

The screenshot displays the 'Select Scenario' step in the WIS optimization process. At the top, a progress bar indicates the current step is 'Select Scenario', with 'Start' completed and 'Check', 'Push Commands', and 'Finish' pending. Below the progress bar, a yellow instruction bar reads: 'Please drag the group to the corresponding scenario.' A group named 'ws6816' is shown in a list. Below this are eight scenario cards, each with a 'Settings' icon and a description:

- General**: default
- Hotel & Dormitory**: APs are installed inside the room, such as dormitory or hotel room.
- Corridor**: APs are installed on the corridor.
- Office**: APs are installed inside the office with little obstruction.
- Outdoor**: APs are installed on the utility pole or the rooftop.
- Many Interferences**: APs are installed in a scenario with many interferences.
- Conference Hall**: APs are installed in a conference hall.
- Custom**: ACs are installed in a scenario requiring customization service.


Drag the AP group to the corresponding scenario. Different scenario has different optimization strategy. If your environment doesn't match any of these scenario, you may just choose the general scenario.

After the scenario selecting, you can follow the guidance displayed on the webpage and finish the scanning and optimization. WIS would automatically push the optimization solution to the AC.

Optimization / Health Check

Health Check Optimization Record

Start Select Scenario Check Push Commands Finish



Complete

Optimized AP Group(s):2 . Time Used:1 min
 Push Success: 512 command(s). Push Failure: 0 command(s).

Optimization succeeded


Status	AC	AP Group	Total Commands
✓	[blurred]	CK	198
✓	[blurred]	default	314

Details Back

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.

Intelligent Access

Roaming Stickiness Remote Association 2017-03-14

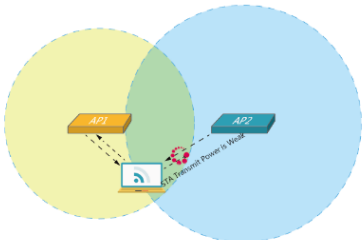


Problem
 When an STA crosses the coverage area, it does not roam into the new coverage area. Instead, it stays associated with the AP in the old coverage area.

Solution
 1. Determine the coverage area properly
 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.

➤ **Roaming Stickiness (optional)**

If roaming stickiness exists, enable this function. Roaming stickiness is relevant to the NIC capability of clients. 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.

[Config Planning](#)

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

Power Plan
Config Check
Scheduled Change

AC MAC

	AC Mac	AP Group	Unconfigured Power Rate	Unconfigured 2.4G Power Rate	Unconfigured 5G Power Rate	
<input type="checkbox"/>		XSS-2#WLY				Change All Powers ▼
<input type="checkbox"/>		XSS-17#WYY	0.17%	7.3%	3.74%	Change All Powers ▼
<input type="checkbox"/>		XSS-16#WYY				Change All Powers ▼
<input type="checkbox"/>		XSS-1#3#WLY				Change All Powers ▼
<input type="checkbox"/>		BG-XDWLZX				Change All Powers ▼

Showing 1 to 5 of 8 entries
First Previous 1 2 Next Last

Configuration Item

Power dbm

2.4GPow dbm

5GPow dbm

2.4GCov dbm

5GCov dbm

Beacon

2.4G ms

5G ms

ResponseRssi

2.4G dbm

5G dbm

Mcell

Disable 2.4G ▼

Disable 5G ▼

Build Config
Push Config

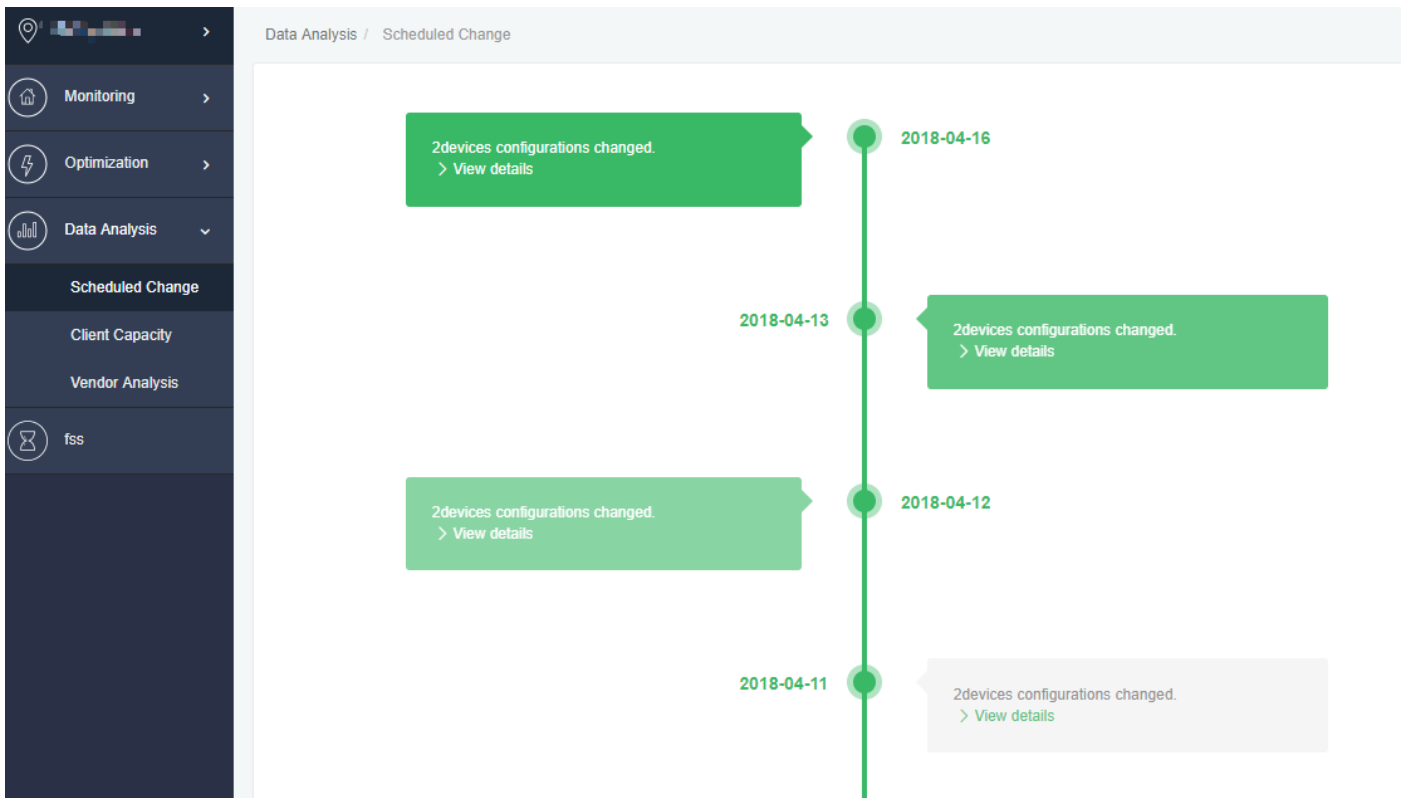
➤ **Power Plan**

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**, and **ResponseRssi**.

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.*

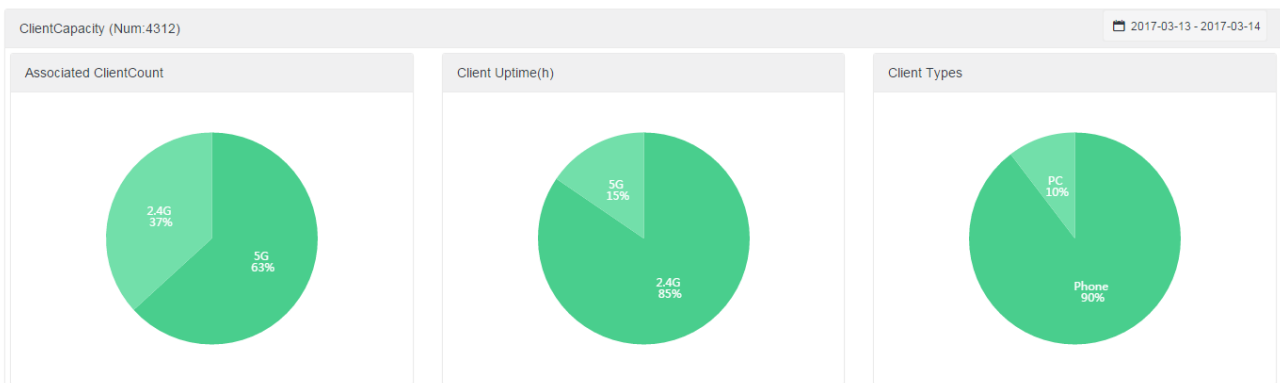
➤ **Scheduled Change**

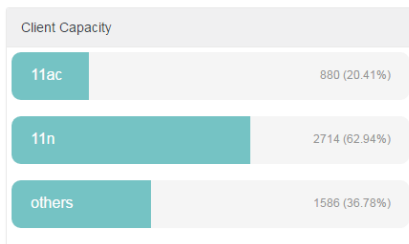
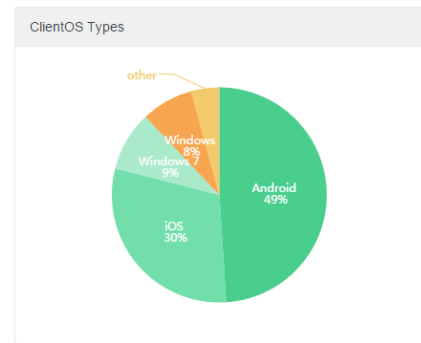
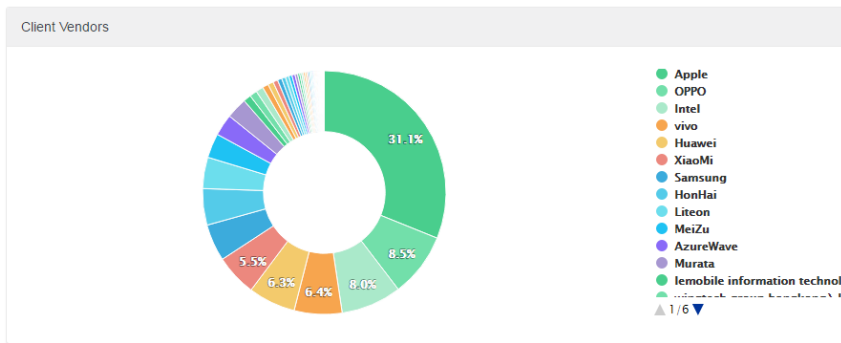


This function allows you to track history and display details of each configuration change of the device.

3.1.4 Data Analysis

The data analysis module is extensible based on user requirements. WIS 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.

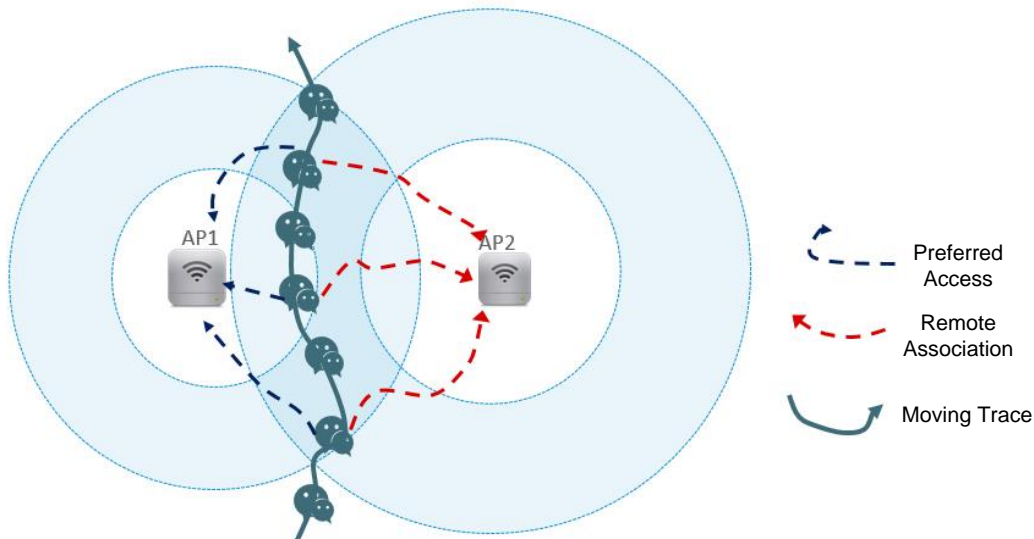
Solution:

- 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.

Remote Association

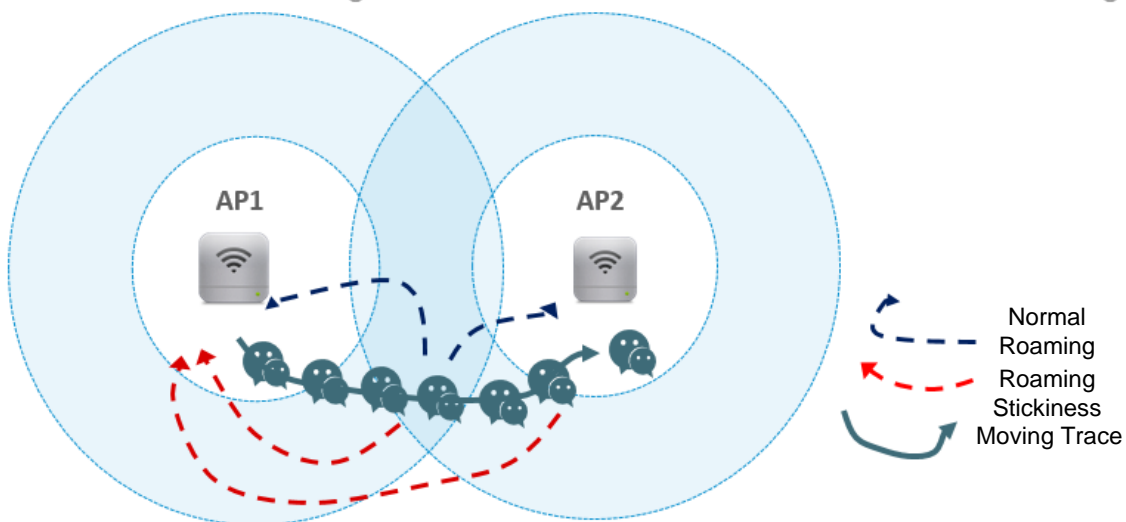
Problem description: The power of AP2 is higher than that of AP1 nearby, and therefore a client regards that signals of AP2 are stronger. In fact, the distance between the client and AP2 is longer. Although downlink signals of AP2 are stronger, uplink signals are weak. Therefore, user experience is poor. 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.

4. FAQ

4.1 AC cannot connect to WIS

Step 1: run the "wis debug-cli 12" command on AC

```
Ruijie(Config)# wis debug-cli 12
```

```
Wis_global_enable    [enable]    -----whether the function is enabled
Wis_control_enable   [enable]    -----whether the communication between AC and WIS is normal
Server [xx.xx.xx.xx:port] -----whether the WIS server address is configured
Source [a.b.c.d]          -----whether the source IP is designated
```

If "Wis_control_enable" shows disabled, it means the AC cannot access to the WIS server. You need to check the internet connection and make sure the AC can access to the internet first.

Step 2: run the following commands on ac:

```
Ruijie#run-system-shell
~ # curl -I http://35.187.254.197:80/wis/tlv
```

If the command returns any kind of error, like "couldn't connect to server" or "login is required", it means there would be a firewall in the network or authentication is required. We need to make sure the tunnel from AC to WIS server's 80 and 443 ports is normal.

Step 3: check the WIS project info on WIS site:

WISn URL : <http://wis.ruijienetworks.com>

[Create Project](#) [Apply for Project Membership](#) Show 10 Items

Status	Project Name	Updated on (Updated Hourly)	Check Score	ACs	APs	Clients	Action
	اسم المشروع	2018-05-02 09:08:11	83.0	2	76	361	Edit Device Member Details
	اسم المشروع	2018-05-02 09:08:14	90.0	1	600	2031	Edit Device Member Details
	اسم المشروع	2018-05-02 09:08:13	70.0	1	44	45	Edit Device Member Details
	اسم المشروع	2018-05-02 09:08:13	70.0	1	86	0	Edit Device Member Details
	اسم المشروع	2018-05-02 09:08:15	70.0	1	34	124	Edit Device Member Details

Entries 1 - 5 . Total: 5 First < 1 > Last

اسم المشروع MAC Settings X

Show 10 Entries

AC MAC	AC Alias	Status	Action
اسم الـ MAC		Valid	Generate Config Disable Edit Delete
اسم الـ MAC		Valid	Generate Config Disable Edit Delete

Entries 1 - 2 . Total: 2 First < 1 > Last

[Add AC](#)

We need to make sure the AC's MAC address is correctly added on WIS. Note: If VAC is performed, all MAC addresses of VAC members should be added to WIS.

If the above steps still cannot resolve your problem, please contact us on Skype:
service_rj@ruijienetworks.com

4.2 Some diagrams of WIS cannot be shown correctly

You may try the following steps to resolve the issue:

Step 1: make sure the AC's time is correctly set.

Step 2: make sure the WIS project's country code is correctly set.

WISit URL : <http://wis.ruijienetworks.com>

Create Project

Apply for Project Membership

Show 10 Items

Enter a search term

Status	Project Name	Updated on <small>(Updated Hourly)</small>	Check Score	ACs	APs	Clients	Action
	Ums-Project	2018-08-13 11:08:53	82.0	2	76	440	Edit Device Member Details
	Ums-Project	2018-08-13 11:09:00	87.5	1	600	1344	Edit Device Member Details
	Ums-Project	2018-08-13 11:08:56	70.0	1	44	119	Edit Device Member Details

Edit Project

Project Name

Progress

Country/Region

-
-
-
-
-
-
-

If any of the above setting is modified, please wait 15 mins and see if the diagram can be shown correctly.

If the above steps still cannot resolve your issue, please contact us on

Skype: service_rj@ruijienetworks.com