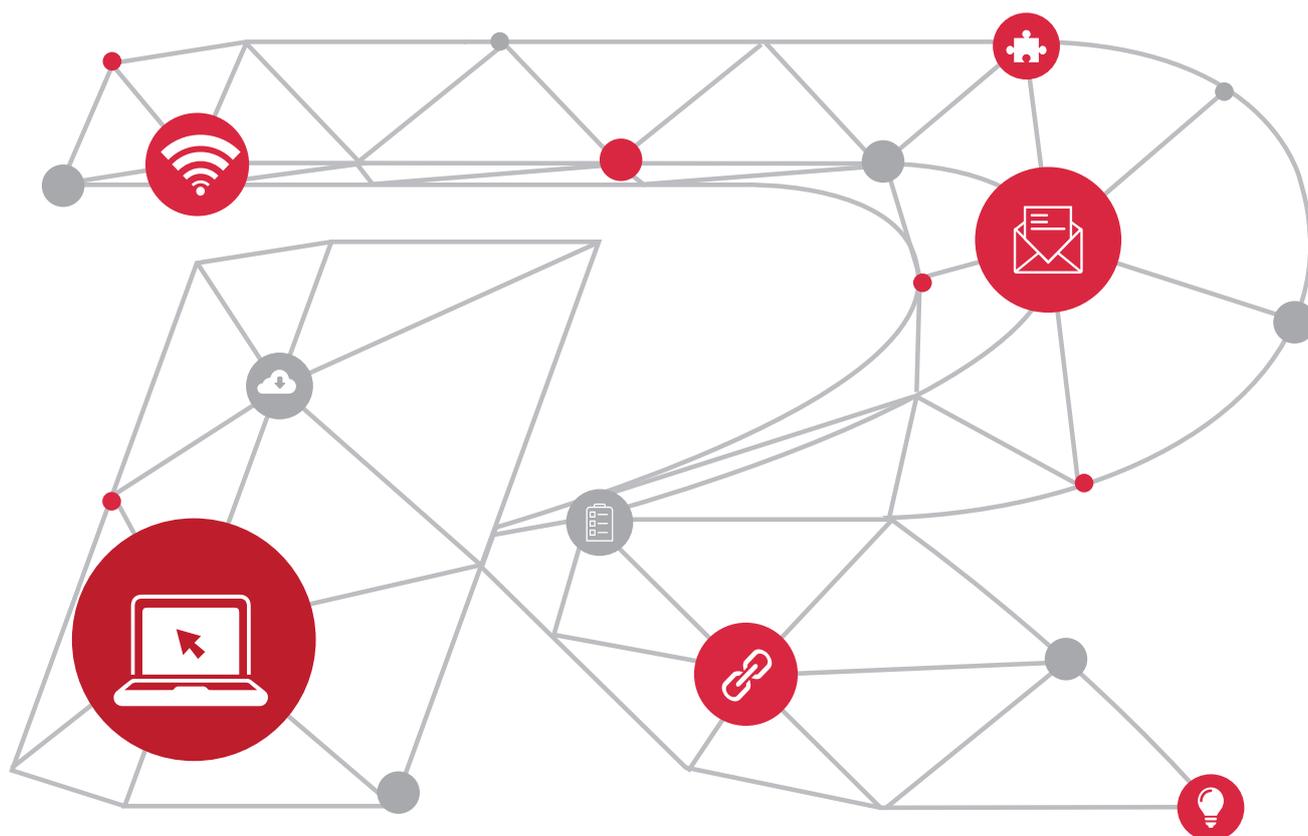


# Ruijie Load Balancing Technology

White Paper



# Contents

Introduction.....	3
Technical Principle.....	4
Technical Features .....	4
Typical Application .....	5
Traffic-based Load Balancing.....	5
Quality-based Load Balancing.....	6
Configuration .....	7
Conclusion.....	8

## Introduction

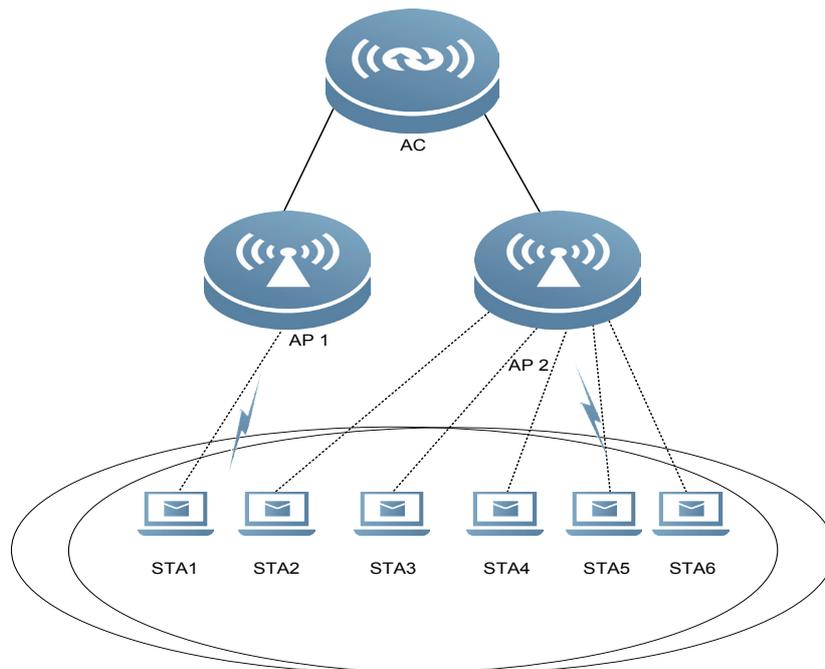
When multiple APs have the same coverage area, if a large number of clients access a same AP, the AP will have high load, but other APs may be idle, thereby reducing the resource utilization. The load balancing technology can be used to solve this problem. This technology allows clients to connect to different APs, thereby maximizing the AP resource utilization.

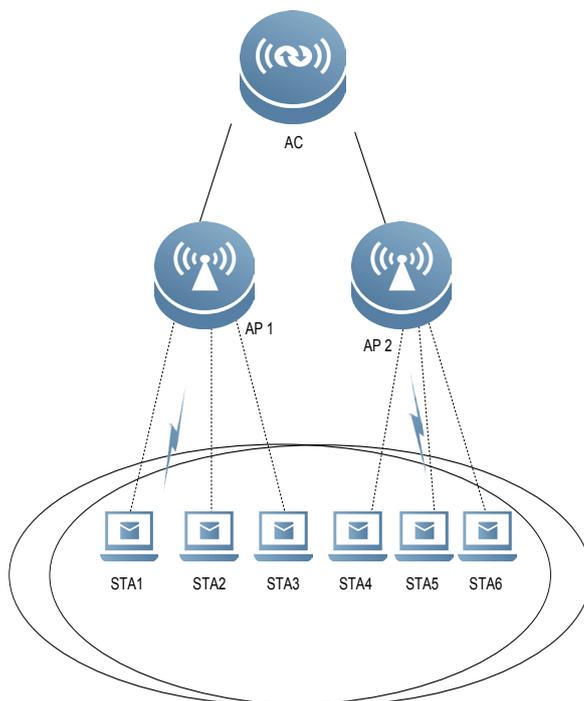
This document describes the concept, typical applications, and configuration examples of the load balancing technology.

There is no obvious physical boundary between wireless network media. Most of AP coverage areas overlap to build a robust network. When a client wants to connect to the wireless network, multiple APs are accessible. Therefore, the client will select an AP with optimal performance by using a certain algorithm. As a result, a large number of clients may be connected to a same AP. In this case, the AP will have over load, but other APs may be idle. This lowers AP resource utilization and STA efficiency.

Figure 1 shows the unbalanced load. An AC manages two APs, and most of the coverage areas of the two APs overlap; six STAs can detect the two APs and connect to either of them. In this case, multiple STAs may connect to a same AP (see Figure 1). The load balancing technology is used to balance traffic load between the APs (see Figure 2). This technology allows STAs to connect to different APs, thereby maximizing AP resource utilization.

**Figure 1 Unbalanced Load**



**Figure 2 Balanced Load**

## Technical Principle

With the load balancing technology, an AC determines whether to connect a client to an AP, thereby ensuring that the number of clients connected to different APs or the traffic of the APs is relatively balanced.

There are two modes of load balancing: quantity-based mode and traffic-based mode. The quantity-based mode is to determine whether to connect a client to an AP according to the number difference of clients connected to different APs in the load balancing group. The traffic-based load balancing mode is to determine whether to connect a client to an AP according to the traffic difference of clients connected to different APs in the load balancing group.

Load balancing includes static load balancing and dynamic load balancing. Static load balancing refers to that a load balancing group is statically configured by a user; dynamic load balancing refers to that an AP keeps listening to client information and dynamically establish a load balancing group. It is easy to configure dynamic load balancing. However, because AP keeps listening to the client information to update the load balancing group, a relatively large number of packets are exchanged between an AC and an AP. For static load balancing, the load balancing group is already configured. A few packets are exchanged between the AC and the AP, and it is easy to determine the AP participating in the load balancing.

## Technical Features

Ruijie load balancing is static. That is, APs of a load balancing group are specified. When a client wants to join in a load balancing group, the AC deems that the client can identify and balance all the APs in the group.

Ruijie load balancing method provides the following features:

1. A few packets are exchanged between an AC and an AP.
2. It is easy to determine AP participators in load balancing.

## Typical Application

### • Restoration of Connection Between the RIPT-AP and the AC

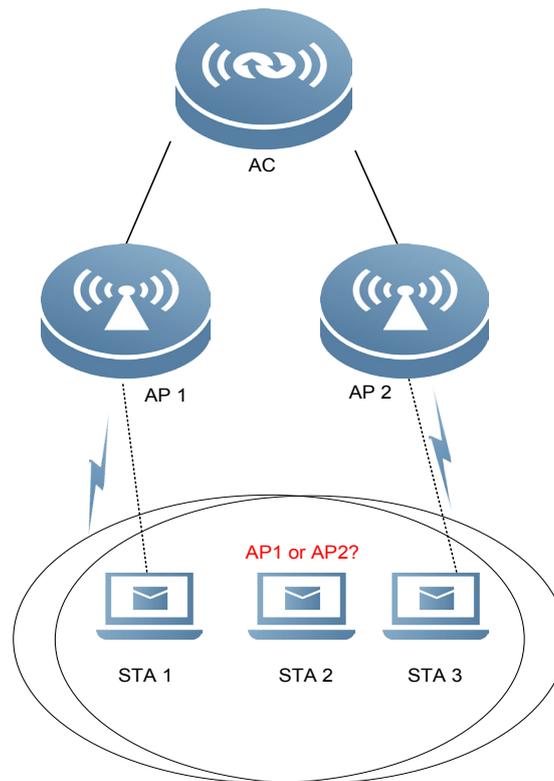
#### Typical Scenario

Assume that the scenario is as follows (see Figure 3):

1. Two APs are deployed in a meeting room, and multiple STAs connected to the Internet at a time.
2. STA 1 is associated with AP 1 and is generating 1 MB traffic.
3. STA 3 is associated with AP 2 and is generating 2 MB traffic.

A STA joins in an AP by itself. Therefore, when accessing the network, STA 2 may join in either AP 1 or AP 2. If STA 2 joins in AP 2, the load difference between the two APs will increase, thereby reducing the network utilization.

**Figure 3 Typical Scenario**



Based on the concept of the traffic-based load balancing in the foregoing scenario, when STA 2 tries to connect to the network:

1. When STA 2 is first associated with AP 1, the AC deems that the load of AP 1 is lower than that of AP 2, and therefore directly connects the STA 2 to AP 1.
2. When STA 2 is first associated with AP 2, the AC deems that the load of AP 2 is higher than that of AP 1, and therefore does not connect STA 2 to AP 2. After that, STA 2 is automatically connected to AP 1.

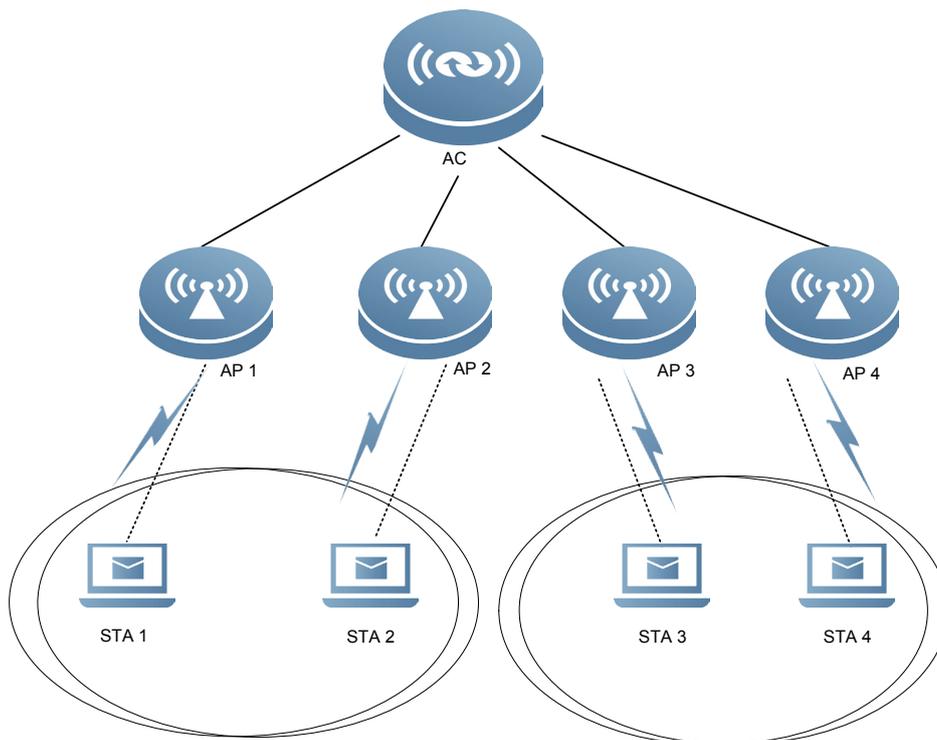
From the foregoing description, a threshold of load difference must be set for the AC to determine whether to reject the connection from a STA. When the load difference between the APs exceeds the threshold, the STA can only join in an AP with relatively lower load instead. In the foregoing scenario, a threshold of 1 Mbps achieves most excellent load balancing.

## Load Balancing Group

The first step to configure the traffic-based load balancing is to create a traffic-based load balancing group. The traffic-based load balancing group consists of APs associated with the same AC. The RF coverage areas of these APs form the load balancing domain, and each STA in the load balancing domain must be able to detect signals of any AP in the load balancing group. Each load balancing group achieves load balancing.

As shown in Figure 4, the coverage areas of AP 1 and AP 2 significantly overlap, and the coverage areas of AP 3 and AP 4 significantly overlap. Therefore, AP 1 and AP 2 form a load balancing group, and AP 3 and AP 4 form another load balancing group. The load balancing groups need to be configured based on the deployment of APs.

**Figure 4 Traffic-based Load Balancing Group**



## • Quantity-based Load Balancing

### Typical Scenario

The operating principle of quantity-based load balancing is the same as that of traffic-based load balancing. The load difference threshold in the quantity-based load balancing, however, refers to the threshold of the difference of quantities of STAs associated with APs.

## Load Balancing Group

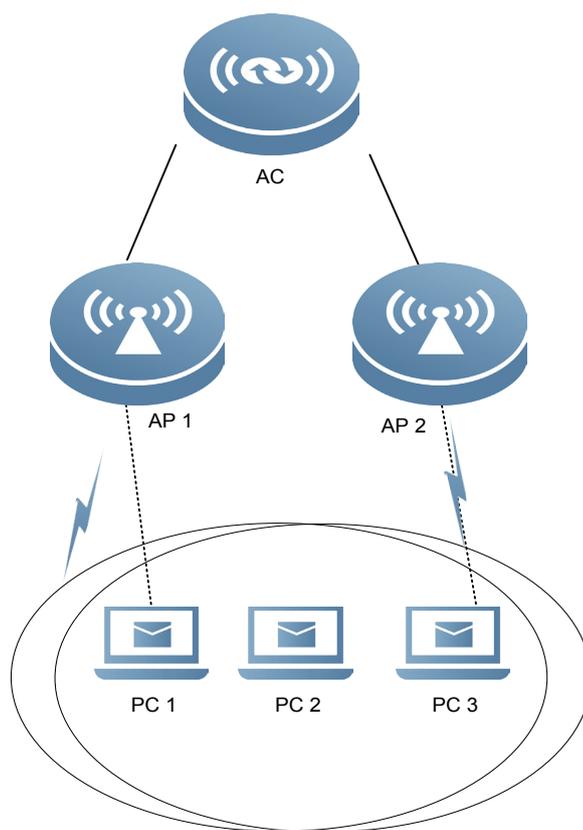
The principle of a quantity-based group for load balancing is the same as that of a traffic-based group. An AP belongs to one single load balancing group at a time; that is, it cannot belong to both types of groups meanwhile.

## Configuration

To configure the traffic-based load balancing, you should create a load balancing group, specify a load threshold, and add inter-area APs to the load balancing group on demand. The following describes the configuration procedure.

As shown in Figure 5, there are one AC and two APs (AP1 and AP2); PC 1 connects to AP 1, and PC 2 connects to AP 2. Because the coverage areas of AP1 and AP2 significantly overlap, PC 2 may connect to either AP 1 or AP 2 whose traffic load maybe high, thereby lowering network utilization. After the load balancing group is configured, when PC 2 wants to access the network, it will be connected to an AP with relatively low traffic load.

**Figure 5 Topology of a load balancing group**



### \* Procedure

Step 1: Create a load balancing group.

!Enter AC configuration mode, and create a load balancing group.

```
Ruijie(config)# ac-controller
```

```
Ruijie(config-ac)# flow-balance-group create test-group
```

!Set the load threshold of the load balancing group to 1000 kbps.

```
Ruijie(config-ac)# flow-balance-group flow test-group 10
```

!Add AP1 and AP2 to the load balancing group "test-group" (After AP1 and AP2 are added to a same load balancing group, the PCs served by the group can detect RF signals from all APs in the group).

```
Ruijie(config-ac)# flow-balance-group add test-group AP1
```

```
Ruijie(config-ac)# flow-balance-group add test-group AP2
```

```
Ruijie(config-ac)# exit
```

## Conclusion

With Ruijie static load balancing technology, an AC determines whether to connect a client to an AP, thereby limiting the number of clients connected to the APs and balancing AP traffic. This technology maximizes the AP resource utilization.



Ruijie Networks Co.,Ltd

For further information, please visit our website <http://www.ruijienetworks.com>  
Copyright © 2018 RuijieNetworks Co.,Ltd.All rights reserved.Ruijie reserver the right to change, modify,transfer,or otherwise revise this publication without notice,and the most current version of the publication shall be applicable.